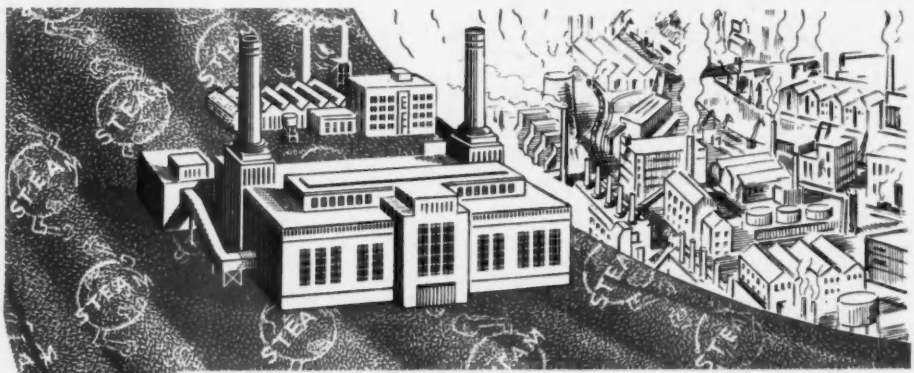
ELECTRICAL TIMES

THURSDAY
28 AUG.
1952
NINEPENCE



The economic pattern . . .

Through the pattern of the world's economy run the warp and weft of *steam and electricity*, the most important sources of world industrial power . . . and the most important factor in the production of *steam*, either for generating electricity or for industrial processing, is **BABCOCK steam-raising plant,** made by the world's largest manufacturers of boilers and boiler house equipment.

Makers of
POWER STATION
INDUSTRIAL and
MARINE BOILERS
and boiler house equipment

STEAM

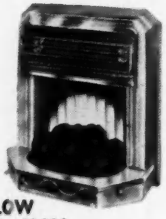
BABCOCK
STEAM
RAISING PLANT

BABCOCK & WILCOX LIMITED
BABCOCK HOUSE, FARRINGDON STREET, LONDON, E.C.4

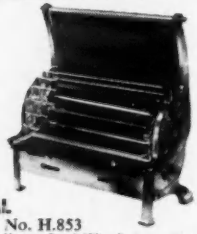
GOOD LOOKS AND WARM HEARTS

—easy consciences. For electric fires don't waste fuel —they *save* it! On, or off, in a jiffy: while solid fuel takes ages to 'catch'—and to go out—very uneconomical. Moreover, the poor quality fuel used to make electricity can't be put to any other use. Creda fires are just as efficient and economical as the electricity they serve. Here's a selection: order now

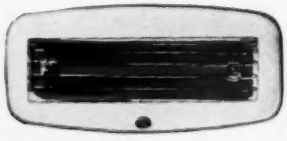
Guards to B.S.S. 1670/52 available on request. No extra charge



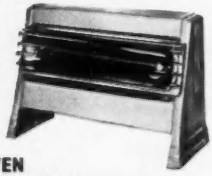
MARLOW
List No. H.906
Loading 3 kW (2-1,500 w. elements)
Dimensions 25" x 22" x 8"
Finish: Old silver **£13.4.0 plus P.T.**



TEAL
List No. H.853
Loading 2 kW Solex elements.
Dimensions 16" x 15¼" x 7¼" Finish: Shaded silver. Reflector polished aluminium **£3.19.6 plus P.T**



1 kW FLAT-BACK
List No. H.828
Loading 1 kW Solex element
Dimensions 8" x 17" x 4¼"
Finish: Cream stove enamel
Polished aluminium reflector
£2.10.0 plus P.T.

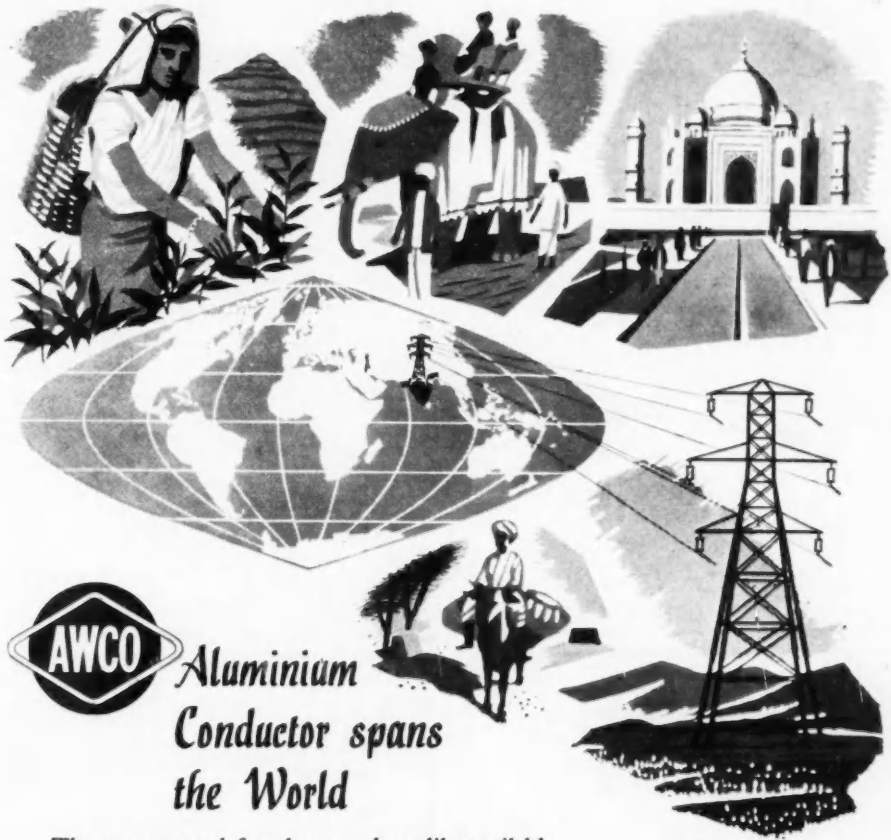


RAVEN
List No. H.834
Loading 1 kW Solex element
Dimensions 10¼" x 15" x 6"
Finish: Cream, Birch grey or old stone
Reflector in polished aluminium
£2.12.0 plus P.T.

Creda ELECTRIC FIRES

MADE BY THE HOUSE OF Simplex

Simplex Electric Company Limited Creda Works Blythe Bridge Staffs A TI COMPANY



AWCO

Aluminium Conductor spans the World

The urgent need for cheap and readily available power has in recent years spread over the whole of the world's land surfaces.

The peoples of the orient having sought and found autonomy need mechanical power to consolidate their independence. Aluminium conductors can carry that vital necessity from the source to the consumer by trans-continental grids and by house distribution lines to cities, factories and homes.

India

potentially one of the greatest industrial producing areas of the world with an ever increasing population has a desperate need of electrification.

ALUMINIUM WIRE & CABLE CO. LTD.

HEAD OFFICE AND WORKS: PORT TENNANT, SWANSEA, GLAMORGAN
SALES OFFICE: 37 THURLOE STREET, SOUTH KENSINGTON, LONDON, S.W.7
TELEPHONE: KNIGHTSBRIDGE 1721/4

210-62

A

IT PLUGS INTO ANY POWER POINT!

It sells because it saves!

Tricity 473A COOKER

SAVES FUEL · SAVES SPACE
DOES NOT HEAT KITCHEN · REQUIRES NO SPECIAL WIRING

Look at some of the advantages of the famous Tricity 473A Cooker, and then look at the price. It cooks a family meal with the minimum of electricity, and is in great demand by users of solid fuel cookers as an alternative cooking method during the summer.

3 types to choose from :

473A
Standard model as illustrated. Acid resisting vitreous enamel. Price £15 7s. 6d.

473A/T
Similar to Standard model but fitted with a thermostatic oven control. Price £17 1s. 0d.

473A/TSR
As for 473A/T and with an "MV" radiant grill with Simmerstat control. Price. £18 18s. 0d.

13 amp fused plug and socket—7/6 extra

Send for details to :

TRICITY COOKERS LTD · 109 KINGSWAY · LONDON · W.C.2

PROSCON THERMOSTATS

for

AIR & LIQUID

TEMPERATURE

CONTROL

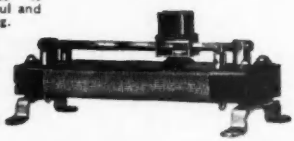
PROCESS CONTROL GEAR Ltd.
56 Victoria Street, St. Albans, Herts.
ST. ALBANS 2030 PROCONGEAR ST. ALBANS

IT IS A "CRESSALL-PRODUCT"

CRESSALL Resistances incorporate the soundest electrical and mechanical principles in design—yet prices are competitive.

CRESSALL Resistance

List No. 80 containing data and prices of our standard sliding Resistances is both useful and interesting. May we send you a copy?



CRESSALL

Registered Trade Name of

THE CRESSALL MANUFACTURING CO., LTD.
TOWER STREET BIRMINGHAM 19
TELEPHONE: ASTON CROSS 2666 (3 lines)
TELEGRAMS: "OHMIC" BIRMINGHAM

THE GREAT MASTERS

Leonardo da Vinci (1452-1519). A great Italian painter, sculptor, musician, mechanician, engineer and natural philosopher. Although famous for many military and civil engineering projects—at one time he served King Louis XII as "Painter and Engineer in Chief"—he is best known for his portrait of "La Gioconda" the "Mona Lisa", a painting which casts an irresistible spell over all who view it.

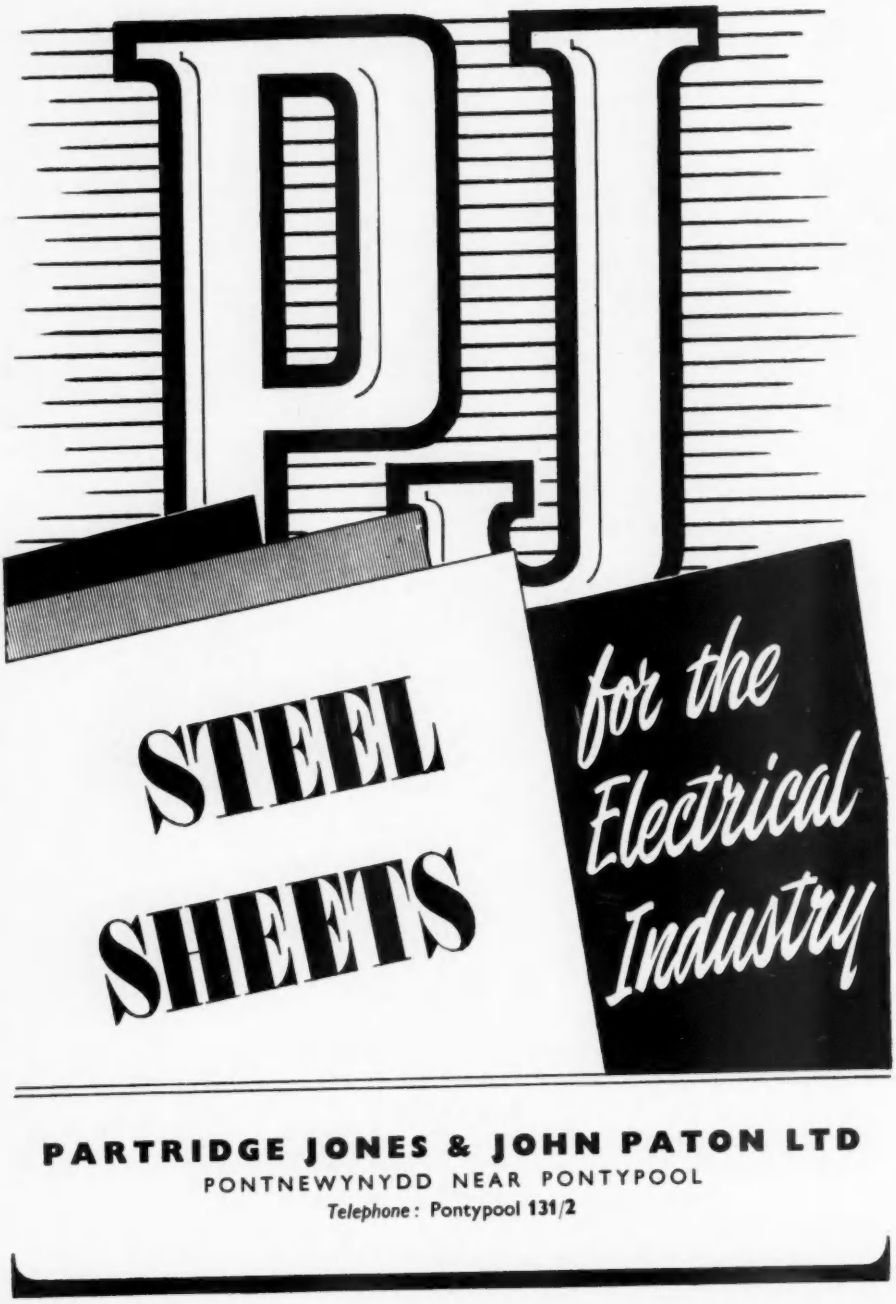
Today Taylor Tunnicliff, though best known as masters of High Voltage Insulation, keep pace with the advances electricity is making in so many widely divergent fields, matching progress with the effective insulation of porcelain.

TAYLOR TUNNICLIFF & CO., LTD.

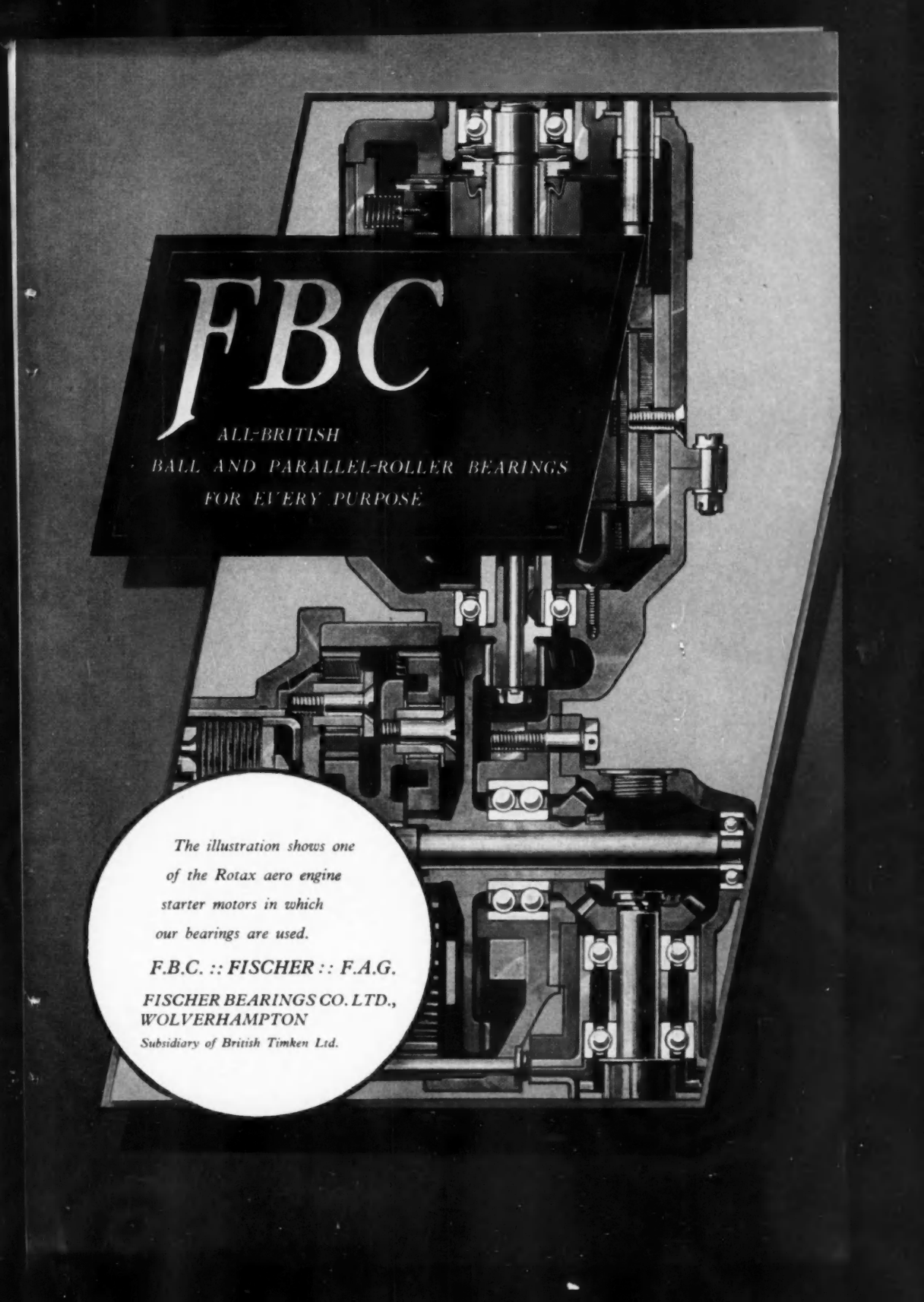
Masters of Porcelain Insulation

PORCELAIN INSULATORS & BUSHINGS FOR ALL HIGH VOLTAGE INSULATION · DIE MADE PORCELAINS
LOW LOSS CERAMICS · REFRACTORIES FOR ALL ELECTRICAL HEATING · FISH SPINE BEADS

HEAD OFFICE: EASTWOOD · HANLEY · STAFFS · Stoke-on-Trent 5272/4
LONDON OFFICE: 125 HIGH HOLBORN · W·C·1 · Holborn 1951/2



PARTRIDGE JONES & JOHN PATON LTD
PONTNEWYNYDD NEAR PONTYPOOL
Telephone: Pontypool 131/2


FBC
ALL-BRITISH
BALL AND PARALLEL-ROLLER BEARINGS
FOR EVERY PURPOSE
The illustration shows one
of the Rotax aero engine
starter motors in which
our bearings are used.
F.B.C. :: FISCHER :: F.A.G.
FISCHER BEARINGS CO. LTD.,
WOLVERHAMPTON
Subsidiary of British Timken Ltd.

MEM *sets the style— and the performance*

Users of S. P. & N. gear come into their own with MEMSPEL & MEMSPAN. Here at last is switchgear designed specially for the purpose—neat, compact with front operated slow-break A.C. switches and choice of cartridge or rewirable fuses in interchangeable carriers. A revolution in appearance and performance and like all MEM equipment excellent value for money.

MEMSPEL (metalclad) and MEMSPAN (all insulated) switchfuses are made in 15, 30 and 60 amp ratings. There are also 2, 3 and 4 way splitters

MEM Switch, fuse and motor control gear, electric fires and localised lighting equipment

MIDLAND ELECTRIC MANUFACTURING CO. LTD., TYSELEY, BIRMINGHAM 11
Branches in London & Manchester

NALDERS

N C S VECTORMETER

FOR THE CONTROL ROOM

NALDER - IVTCHER
LIPMAN - PATENT

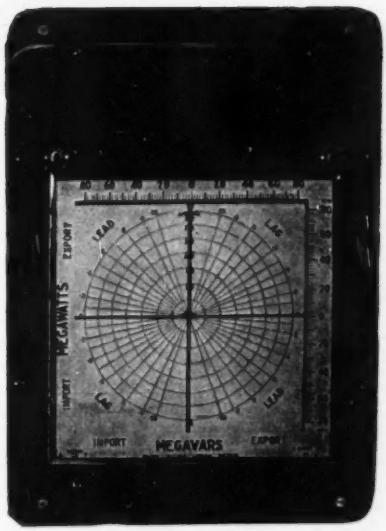
IMPORTANT Power Supply Stations will welcome this specially designed Indicating Instrument for increasing the efficiency of the Control Room.

THE N.C.S. VECTORMETER gives simultaneous readings of Megawatts, Megavars, Amperes and Power Factor of the three-phase system in which it is connected.

It shows also whether Power is being "Exported" or "Imported."

Indication is by two pointers moving at right angles and in straight lines over a common dial. The Megawatt, Megavar and Ampere scales are each 6 ins. long.

Enquiries invited.



N.C.S. PRODUCTS include all types of Measuring Instruments, Indicating or Recording, Switchboard or Portable. Also Protective Relays, Synchronisers, Circuit Breakers, etc. Every unit is designed for maximum efficiency, reliability and durability, prices being competitive without sacrifice of quality.

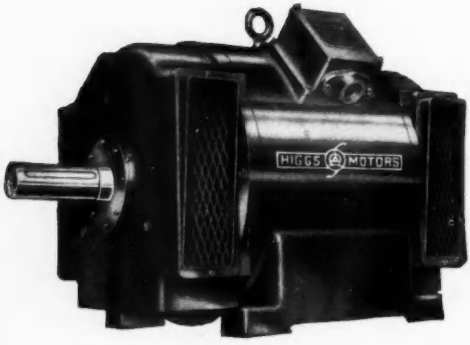
NALDER BROS. & THOMPSON LTD.

DALSTON LANE WORKS, LONDON, E.8

Telephone: Clissold 2365 (3 lines) Telegrams: Occlude, Hack, London

B

TRADE MARK
HIGGS MOTORS LTD.
CHAIRMAN WALTER F. HIGGS M.I.E.E.
BIRMINGHAM 6 ENGLAND



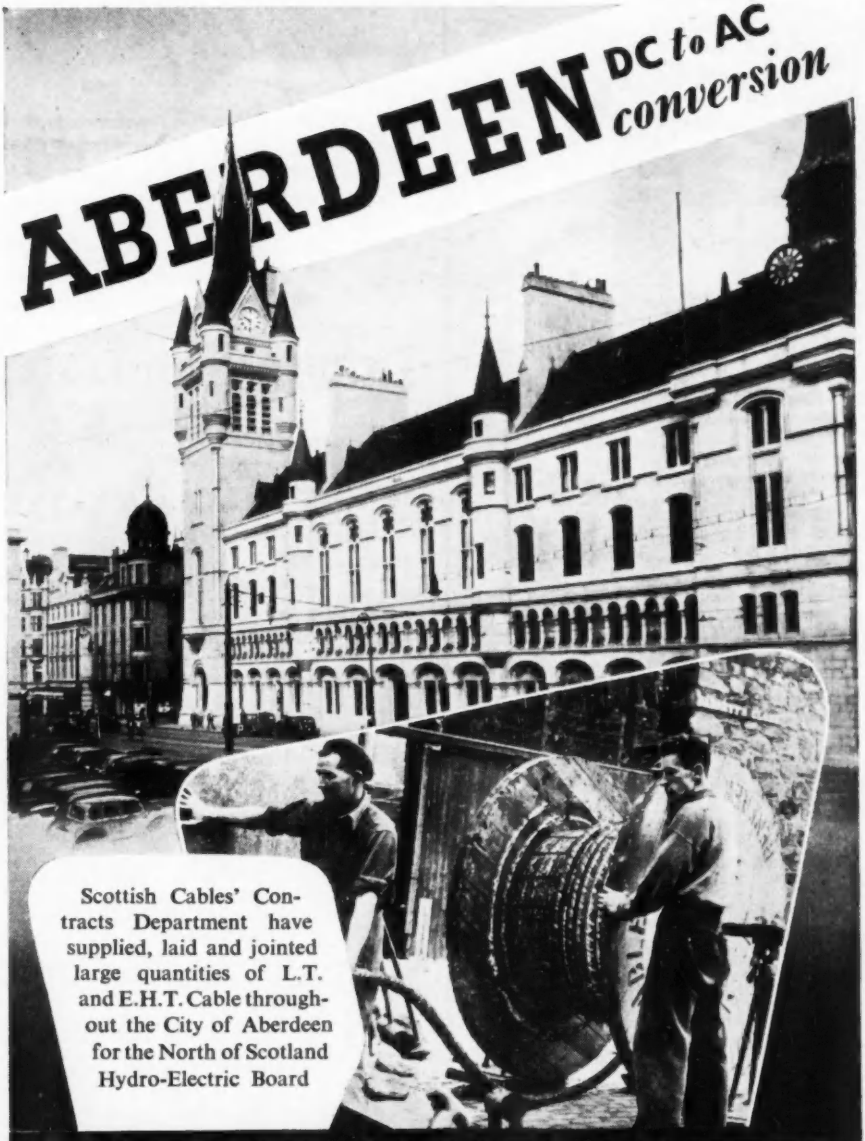
FROM $\frac{1}{8}$ TO 700 HP

The embodiment of sound engineering practice in design and manufacture; your requirements can be met with a competitive unit of proved reliability—in many instances from STOCK

GUARANTEED FOR EVER

Belfast, Birmingham, Bristol, Dundee, Glasgow, London, Manchester, Newcastle, Peterborough, Sheffield, Wolverhampton

ABERDEEN DC to AC conversion



Scottish Cables' Contracts Department have supplied, laid and jointed large quantities of L.T. and E.H.T. Cable throughout the City of Aberdeen for the North of Scotland Hydro-Electric Board

SCOTTISH CABLES LIMITED

DEANSIDE • RENFREW • SCOTLAND

LONDON OFFICE • BUSH HOUSE • ALDWYCH, W.C.2

Associated Company: SCOTTISH CABLES (SOUTH AFRICA) LTD. PIETERMARITZBURG, NATAL

Gives close access even to awkward places—legs span fixed objects.

Folds to go through doorways, narrow gangways and into lifts.

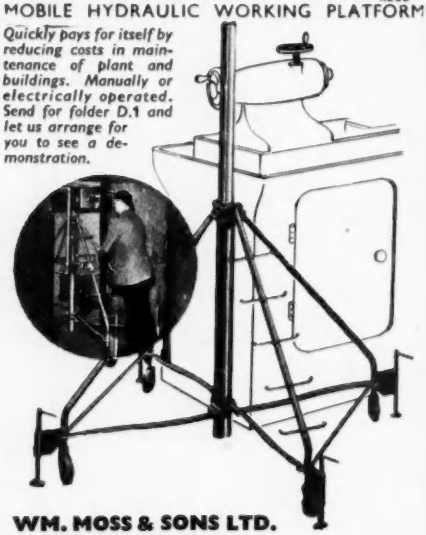
Rises to working heights from 18 ft. to 30 ft.—according to model.

for work overhead

The **BEANSTALK** REGD

MOBILE HYDRAULIC WORKING PLATFORM

Quickly pays for itself by reducing costs in maintenance of plant and buildings. Manually or electrically operated. Send for folder D.1 and let us arrange for you to see a demonstration.



WM. MOSS & SONS LTD.
(*Mechanical Developments Division*)
North Circular Road, Cricklewood, London, N.W.2
Tel. GLAdstone 8080.

T.A.4269

SELL *Flexible* HEATING!

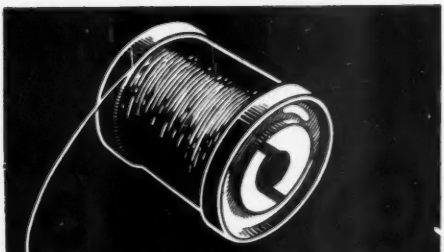
A highly marketable feature of the Thermotube Electric Heater is flexibility of installation. Tubes may be mounted singly or in banks of 2, 3 or 4 *without changing terminal boxes* and provide an ideal heating system for draught prevention and general temperature rise in rooms, passages and on landings.

Thermotube

ELECTRIC HEATERS

The Thermovent Technical Advisory Service is always glad to help in the planning of Space Heating equipment for any kind of building.

THERMOVENT HEATING:
E. K. COLE LTD., 5 VIGO STREET, LONDON, W.1



Coil Winding Machines

of outstanding design and dependable performance

Please send your enquiries to:—

KOLECTRIC LTD

73, UXBRIDGE ROAD
EALING, LONDON W.5

WE SOMETIMES TEND TO OVERLOOK the achievements of the electrical engineering pioneers of the past because to our eyes their designs look clumsy, old-fashioned and ill-conceived. Yet, when we take the trouble to look closer into the subject, we find that many of the first principles they laid down 50 years ago still apply today.

An early electrical engineer who aptly illustrates our point was Henry William Clothier. As far back as 1906, he had produced fundamentally new designs for what he described as Ironclad Switchgear. All over the world much of the switchgear in use and being manufactured and installed is based on the principle laid down by Clothier. Thus, the industry continues to benefit from his work. He was a switchgear specialist. He taught other men to be specialists and helped build the specialist company of Reyrolle.

Our primary concern is designing and producing switchgear, so if you have any transmission or control problems, why not talk to us.

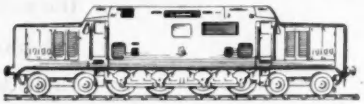
If you want to talk switchgear

. . . talk to Reyrolle

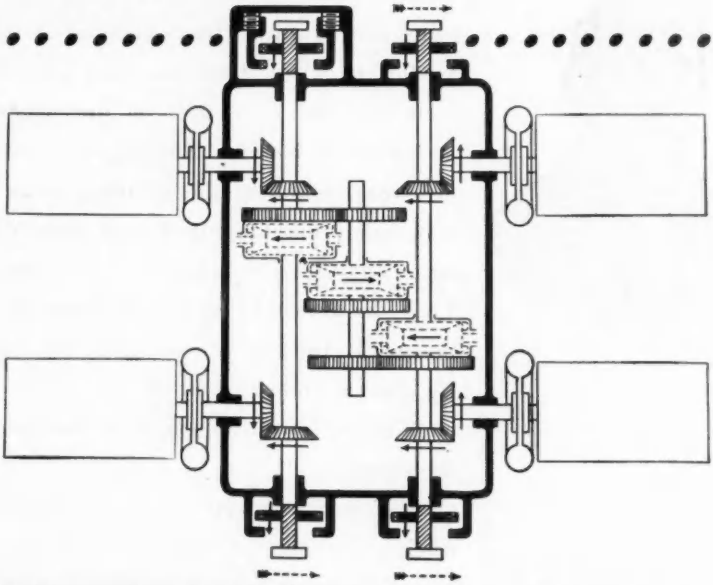
A. REYROLLE & CO., LTD · HEBBURN · CO. DURHAM

CRC 245

Britain's largest mechanical-drive ★ Diesel loco is lubricated entirely with SHELL OILS



British Railways No. 10100 incorporates the "Fell" system of mechanical transmission, invented by Lt.-Col. L. F. R. Fell and developed jointly by Mr. H. G. Ivatt, formerly the chief mechanical engineer of the London Midland Region, and Fell Developments Ltd. No. 10100 is in service between St. Pancras and Manchester. Four 500 h.p. Paxman diesel engines give it over 2,000 h.p.; maximum tractive effort is 26,996 lb. Weight, 120 tons; length over buffers, 50 ft.; maximum speed, 78 m.p.h. Engines are lubricated by Shell Rotella Oil 30; gearbox by Shell Macoma Oil 73.



★ The Fell mechanical drive

The Fell Loco uses differential gears to group together the output of a number of propelling engines. In the case, for example, of four propelling engines (above) the transmission uses three differential gears so arranged that two act as primary differentials and the third as a secondary differential. Each engine is connected through its hydraulic coupling to one of the four sun wheels of the primary differentials. The planet carriers of the two primary differentials are connected by gears, one to each of the sun wheels of the secondary differential, and the planet carrier of this last differential delivers the combined power of all the engines to the road wheels through a train of gears and a final reduction drive. The gears of the reversing train are in constant mesh and by means of a novel arrangement the direction of locomotive travel can be altered. Thus a progressively changing speed ratio is provided without the use of change speed gears involving a series of stepped ratios.

SHELL LEADERSHIP IN LUBRICATION

What is the

R.E.A.L.

cost of re-lamping a Watertight Fitting?

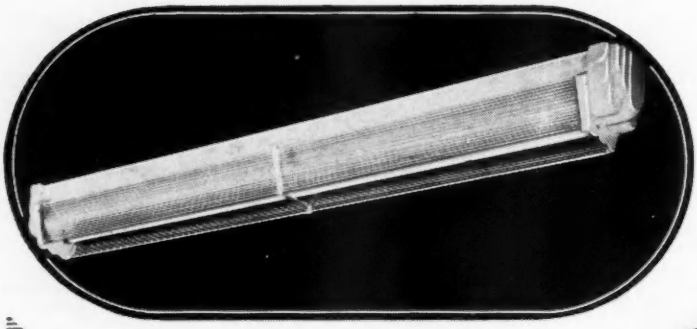
When a lamp goes, as even the best lamp will, then re-lamping is only a moment's job. In the R.E.A.L. Fitting **there is nothing to corrode!**

Pat. No. 568702

THE ONLY ONE-PIECE SCREW-NECK WATERTIGHT FITTING

DETAILS ON REQUEST

Issued by Rowlands Electrical Accessories Ltd., R.E.A.L. Works, Birmingham, 18.



DECORATIVE
COMMERCIAL FITTING
(WITH SPRING LOADED LAMPHOLDERS)
CAT. No. GB/S 24 TWIN – 4ft. 40 WATT.
Our TECHNICAL SALES DEPT. is available to assist you in the preparation of COMPLETE LIGHTING SCHEMES incorporating the above or any of the well known Hi-Craft FLUORESCENT LIGHTING FITTINGS.
May we help you?

No GB/S 24
£7·12·0
+P.T. £0 15 7

Full details from:-

SMART & BROWN (ENGINEERS) LIMITED
TRADING ESTATE, SPENNYMOOR, Co DURHAM

The ELECTRICIAN
WILKINSONS
Tools are designed for YOU
SUPER WILKINSONS TOOLS

FULLY ILLUSTRATED CATALOGUE WITH PLEASURE

WILKINSONS TOOLS LTD.,
KERFOOT STREET, WARRINGTON.
Telephone WARRINGTON 1555/6 ENGLAND. Grams WILKINSONS WARRINGTON

A Weatherproof All-Insulated

SERVICE BOX

Designed for rural installations, the BICC Overhead Service Connection Box offers a convenient method of connecting leads from overhead lines to rubber-insulated H.S.O.S. cables.

Moulded in high-grade insulating material, it is strong, weather resisting and non-hygroscopic. The design is simple, providing easy access to the terminals, resulting in speedy installation.

B.I. Callender's

Overhead Service Connection Box

These units are suitable for use with BICC House Service Overhead System Cables, and should be sealed with BICC Weatherproof Plastic Compound.

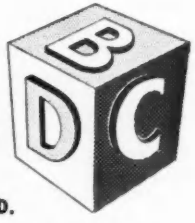
Suitable for two single-core incoming leads and one twin-core outgoing cable in sizes up to 19/.064".

BRITISH INSULATED CALLENDER'S CABLES LIMITED
NORFOLK HOUSE, NORFOLK STREET, LONDON, W.C.2

why pick on us?

Why? Well . . . can you imagine making something as complicated as this electric fan louvre *in one operation* by any other method than pressure die casting?

the whole in one



BRITISH DIE CASTING & ENGINEERING CO. LTD.

Pembroke Works · Pembroke Rd. · London, N.10. TEL: TUDOR 2594-5-6

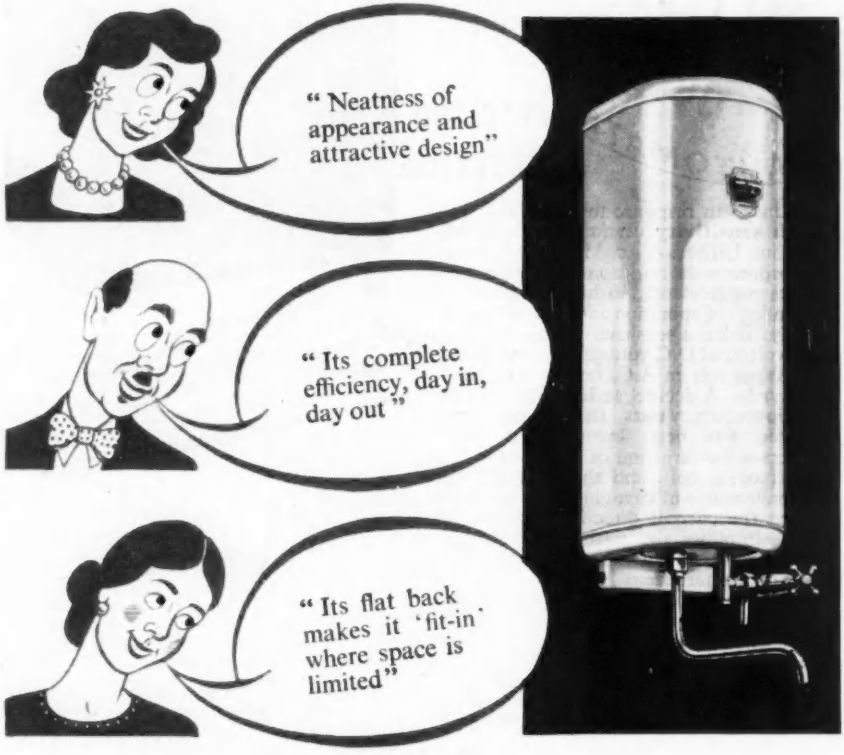
WEST CHIRTON TRADING ESTATE · NORTH SHIELDS · NORTHUMBERLAND · N. SHIELDS 2100

CRC 18

Why is The Heatrae "DOT" ELECTRIC WATER HEATER *so popular?*

Being modest ourselves, we refrain from comment, but various reasons have been suggested to us from our friends in the Electrical Industry.

Here are a few:


" Neatness of appearance and attractive design"
" Its complete efficiency, day in, day out "
" Its flat back makes it 'fit-in' where space is limited"

HEATRAE LTD • NORWICH

★ *Manufacturers of: Electric Water Heaters, Oil Heaters, Immersion Heaters, Urns, Towel Rails, Airing Cupboard Heaters, Flame-proof Heating Apparatus, Breakfast Cookers, Electric Fires, Food Trolleys, Warming Plates, Air Heaters.*

Model 8

UNIVERSAL AVOMETER

20,000 ohms per volt *plus* AUTOMATIC Overload Protection

Produced in response to a demand for a **high sensitivity** version of the world-famous Universal AvoMeter, this model incorporates the traditional design features of its predecessors, so highly valued for simplicity of operation and compact portability. It has a sensitivity of 20,000 ohms per volt on all D.C. voltage ranges and 1,000 ohms per volt on A.C. ranges from 100 V upwards. A decibel scale is provided for audio frequency tests. In addition, a press button has been incorporated which reverses the direction of current through the moving coil, and thus obviates the inconvenience of changing over test leads when the current direction reverses. It also simplifies the testing of potentials both positive and negative about a common reference point.

A wide range of resistance measurements can be made using internal batteries, separate zero adjustment being provided for each range.

It is of importance to note that this model incorporates the "AVO" automatic cut-out for protection against inadvertent overloads.

Sizes: 8¾in. x 7¼in. x 4¼in.
Weight: 6¼ lbs. (including leads).

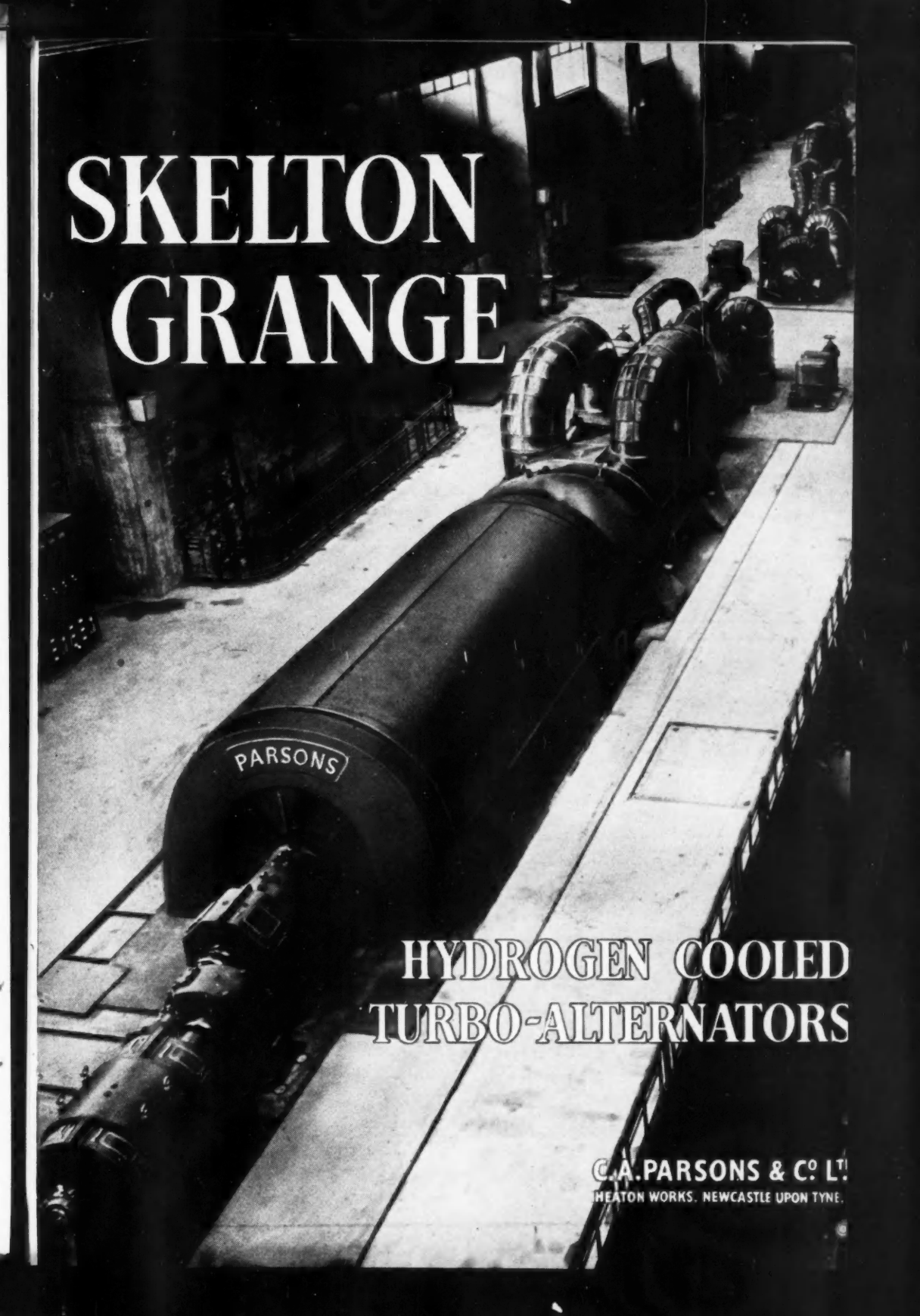
£23 : 10s.

The following accessories are available to widen still further the ranges of the instrument: A Resistance Range Extension Unit to extend the limits of measurement from 0.025 ohms to 200MΩ, a 10 kV D.C. multiplier and a number of A.C. current transformers.

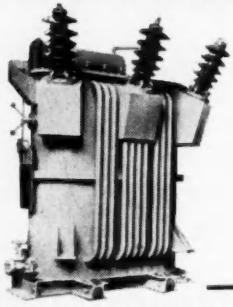
D.C. VOLTAGE	D.C. CURRENT	A.C. VOLTAGE	A.C. CURRENT	RESISTANCE
2.5 V	50μA	2.5 V	100 mA	First indication 0.5Ω
10 V	250μA	10 V	1 A	Maximum indication 20 MΩ
25 V	1 mA	25 V	2.5 A	0-2,000Ω — using internal batteries
100 V	10 mA	100 V	10 A	0-200,000Ω — using internal batteries
250 V	100 mA	250 V		0-20 MΩ — using internal batteries
1,000 V	1 A	1,000 V		
2,500 V	10 A	2,500 V		0-200 MΩ — using external batteries

THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO. LTD.
WINDER HOUSE • DOUGLAS STREET • LONDON S.W.1 Telephone VICtoria 3404—9

A8/1


SKELTON
GRANGE
PARSONS
HYDROGEN COOLED
TURBO-ALTERNATORS
C.A.PARSONS & Co LTD
HEATON WORKS. NEWCASTLE UPON TYNE.

It's **POWER** *transformed!*



POWER TRANSFORMERS
They are available in single- and three-phase types, designed to BSS 171.

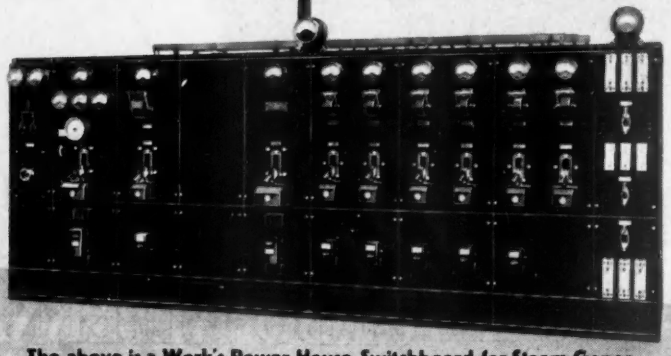
LARGE TO SMALL or small to large voltages —Davenset Transformers for all power applications.

Distribution, Low Voltage Lighting, Electronic Equipment, Electric Furnace, Inductor Arc Projection, Soil Heating and Industrial Loads, etc.

● *Individual Specifications in any quantity delivered quickly.*

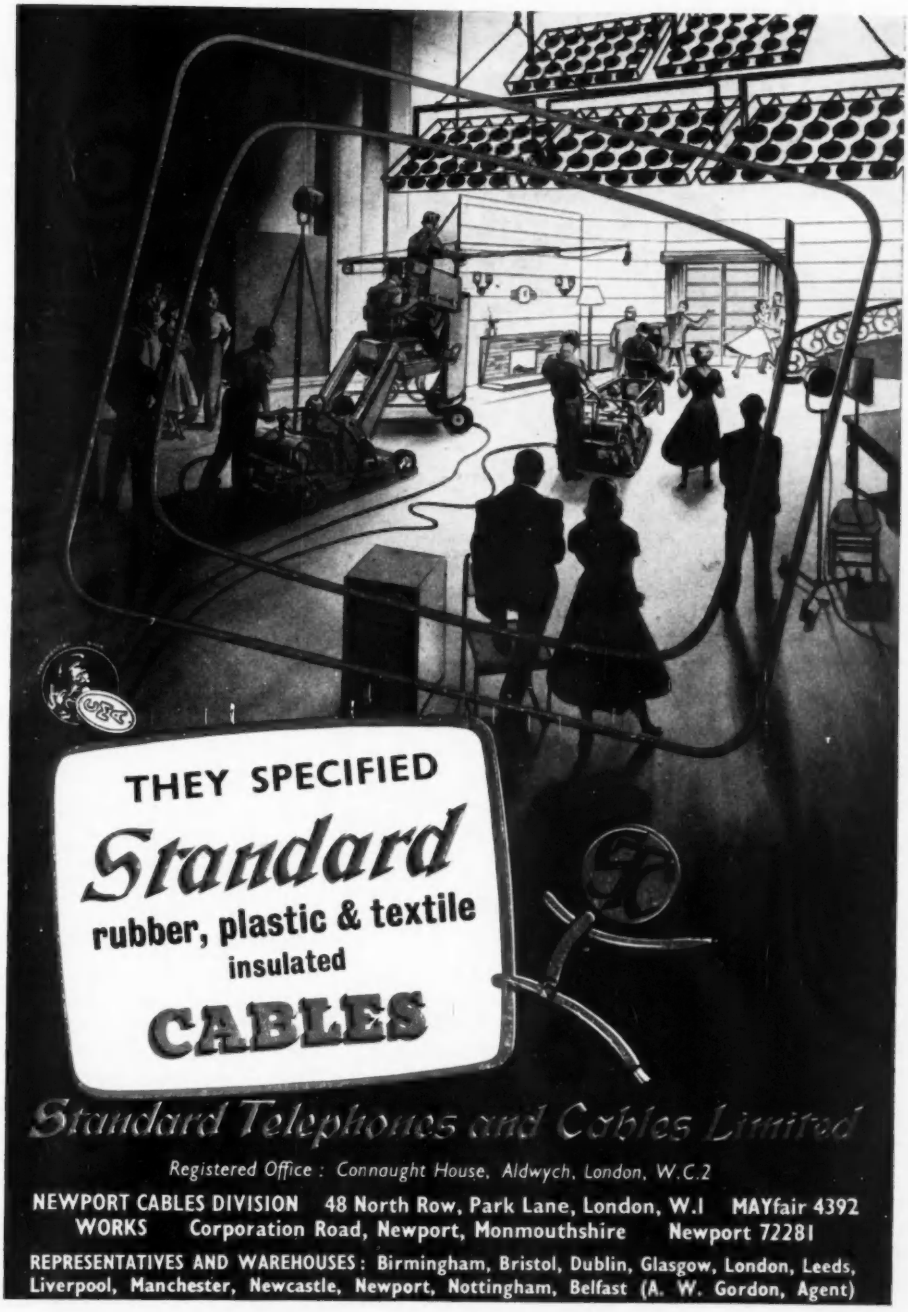
DAVENSET INDUSTRIAL ELECTRICAL EQUIPMENT
PARTRIDGE WILSON AND COMPANY LIMITED
DAVENSET ELECTRICAL WORKS . LEICESTER 5

MUDIE 'DUPLICATE BUSBAR SYSTEM' SWITCH BOARDS



The above is a Work's Power House Switchboard for Steam Generation and Public Supply. For service on 400 Volts 3-phase 50 cycles.

MUDIE'S ELECTRICAL CO., LTD., BIRMINGHAM 28


THEY SPECIFIED
Standard
rubber, plastic & textile
insulated
CABLES
Standard Telephones and Cables Limited
Registered Office : Connaught House, Aldwych, London, W.C.2
NEWPORT CABLES DIVISION 48 North Row, Park Lane, London, W.1 MAYfair 4392
WORKS Corporation Road, Newport, Monmouthshire Newport 72281
REPRESENTATIVES AND WAREHOUSES: Birmingham, Bristol, Dublin, Glasgow, London, Leeds, Liverpool, Manchester, Newcastle, Newport, Nottingham, Belfast (A. W. Gordon, Agent)

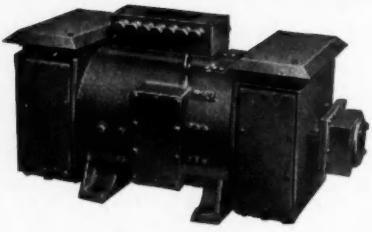
The chance of a "Light" Time...

The **SCEMCO '55'**
DECORATIVE DIFFUSER
IN ALL SIZES FOR TWO OR FOUR LAMPS
Handsomely Styled Properly Priced

Send for details to

SCEMCO of SOHO ST., LONDON, W.1
THE FLUORESCENT LIGHTING SPECIALISTS
TELEPHONE : GERRARD 1461-2-3

NEWTON-DERBY
ELECTRICAL EQUIPMENT



2½ kVA Motor Alternator. Drip-proof to 45°. Motor 220 volts D.C. Output 120 volts, 3 phase, 333 cycles per second. Motor includes an automatic constant-speed governor. Weight 450 lb.

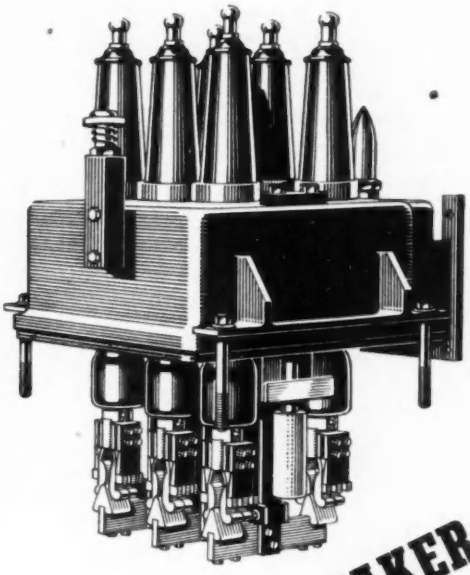
HIGH-FREQUENCY ALTERNATORS

(Send for publication No. 1003/2)

Also makers of Rotary Transformers and Anode Converters, Wind and Engine-driven Aircraft Generators, High-tension D.C. Generators and Automatic Carbon Pile Voltage Regulators.

NEWTON BROTHERS
(DERBY) LTD.

HEAD OFFICE & WORKS: ALFRETON ROAD, DERBY.
TELEPHONE: DERBY 47676 (3 LINES) TELEGRAMS: DYNAMO, DERBY.
LONDON OFFICE: IMPERIAL BUILDINGS, 56 KINGSWAY W.C.2.

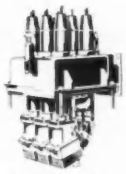


THE Trinal plain-break oil circuit-breaker is A.S.T.A. certified for 37.5 MVA at 600 volts, 100 MVA at 3,300 volts and 150 MVA at 6,600 or 11,000 volts, and has a maximum current rating of 800 amperes. Reliable and versatile in its application, with small overall dimensions and having an oil content of only nine gallons, it can be used with cubicle, truck, or vertical isolation types of gear and is suitable for hand, spring or solenoid operation.

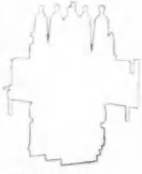
J. & P. TRINAL PLAIN-BREAK BREAKER

ONE OF THE J. & P. TRINAL RANGE

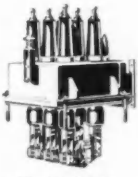
The J. & P. Trinal range comprises an oil switch and two types of oil circuit-breaker—an arc-control type and a plain-break type—all of which have similar fixing dimensions, enabling their ready and economical interchange should system modifications become necessary. Full details are given in Publication SG 86.



The TRINAL Arc-control Breaker



The TRINAL Plain-break Breaker



The TRINAL Oil Switch

JOHNSON & PHILLIPS LTD.

CHARLTON • LONDON • S.E.7

ELECTRICAL ENGINEERS & CABLE MAKERS SINCE 1875

GOOD NEWS!

TEMCO *the Perfect*
IRON CONNECTOR
is now available off the shelf

DELIVERIES FROM STOCK

No longer any need to accept any but the best—thanks to increased production the connector that everyone wants is now in plentiful supply.

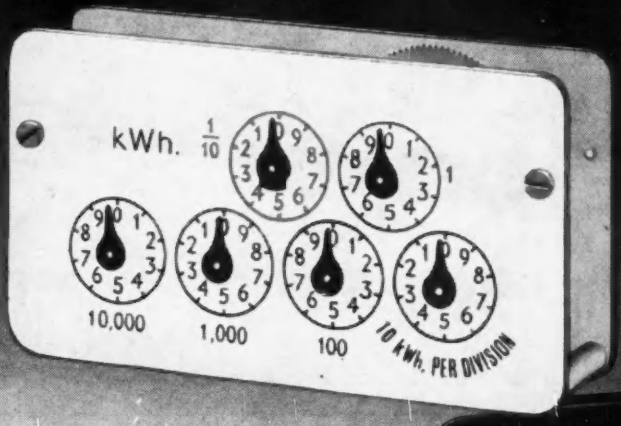
- Made to B.S. 562.
- Double sided earth.
- Independent cord grip; no strain on conductors.
- 2-part phosphor-bronze ringed contact sleeves.
- Extra solid bakelite housing.
- Each one packed in a carton.

NO LOOSE PARTS

TEMCO
SUPER IRON CONNECTORS

Marketed by **T. M. C.-HARWELL (SALES) LTD**
37 UPPER BERKELEY STREET · LONDON W1
Telephone: PADdington 1867-8-9

The FERRANTI F.M. Meter



THE POINTER TRAIN

This registering mechanism is made of light alloys and has a very low friction level. The bearings have anodised surfaces and no lubricant is required.

This is but one of the many unique features of the Ferranti F.M. Meter, epitomising the cumulative experience of over 60 years of meter design and manufacture.

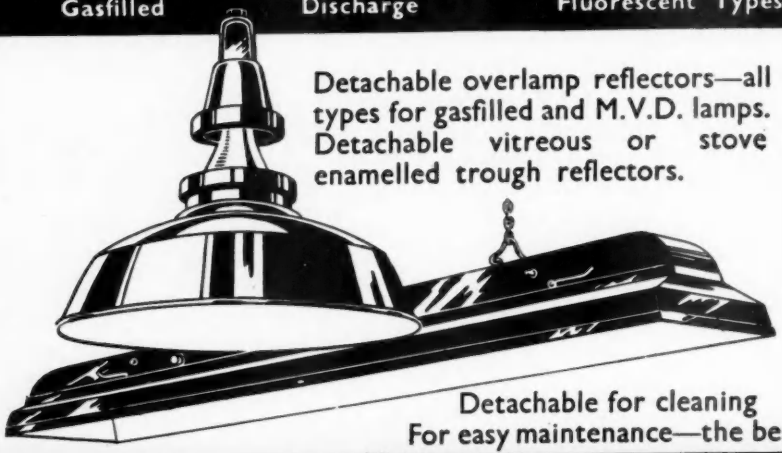
FM95

FERRANTI

FERRANTI LTD., HOLLINWOOD, LANCASHIRE

London Office: Kern House, Kingsway, W.C.2.

THORLUX INDUSTRIAL LIGHTING EQUIPMENT. Manufacturers of Gasfilled Discharge Fluorescent Types



Detachable overlamp reflectors—all types for gasfilled and M.V.D. lamps. Detachable vitreous or stove enamelled trough reflectors.

Detachable for cleaning
For easy maintenance—the best.

F. W. THORPE LTD. WELBY RD HALL GREEN **BIRMINGHAM 28**

SPRINGFIELD 3318 GRAMS: THORLUX B'HAM

"It's a beautifully fitting job, Mr. Ash"

"But we are used to working to fine limits, Mr. Downs."

"*Indeed we are, Mr. Ash. That electrode holder we were asked to make is a good example of that. It was made in two unequal sections, parts of which were very thin; it had to be electrically insulating, and when the two parts were put together they had to make a push fit into a circular orifice, Mr. Ash.*"

"Not an easy job, Mr. Downs."

"*But it was quite successful, Mr. Ash, and now another customer realises that*

If you want to know what plastics can do for you

ask Ashdowns

ASHDOWNS LIMITED,
ECCLESTON WORKS, ST. HELENS, LANCS. Phone: St. Helens 3206. *Ashdowns Ltd. is a subsidiary of Pilkington Brothers Ltd.*

SPECIAL

Cables

C.M.A. MEMBERS WERE THE FIRST WITH :

The Co-Axial Cable for Television

Multi-Circuit Cable and Couplers giving greater mobility for Television Cameras and Apparatus.

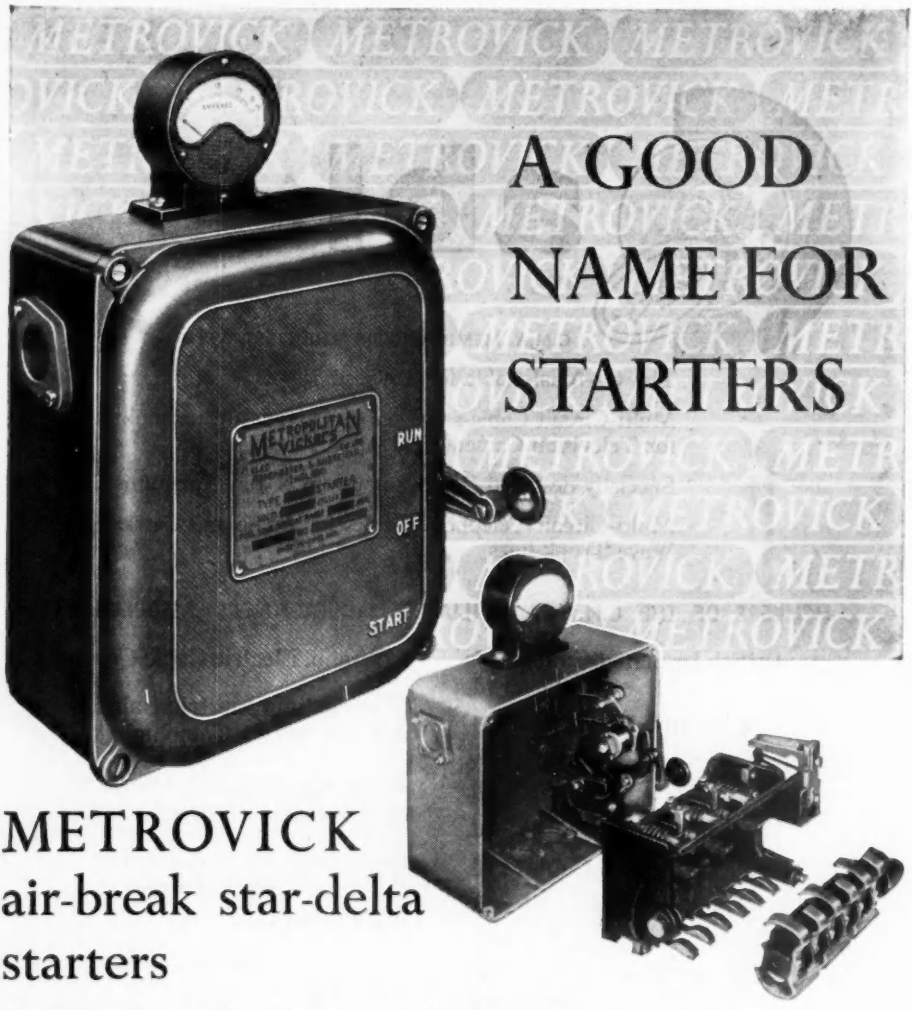
Specially designed Cables for use in X-Ray Apparatus.

Multi-Circuit Telephone Cables for Audio and Carrier Wave Trunk lines.

MEMBERS OF THE C.M.A. & AFFILIATED MANUFACTURERS' ASSOCIATIONS

British Insulated Callender's Cables Ltd.
Connollys (Blackley) Ltd.
The Craigpark Electric Cable Co. Ltd.
Crompton Parkinson Ltd.
Enfield Cables Ltd.
The Edison Swan Electric Co. Ltd.
Greengate & Irwell Rubber Co. Ltd.
W. T. Glover & Company, Ltd.
W. T. Henley's Telegraph Works Co. Ltd.
Johnson & Phillips Ltd.
Liverpool Electric Cable Co. Ltd.
Metropolitan Electric Cable & Construction Company Ltd.
Pirelli-General Cable Works Ltd. (The General Electric Co. Ltd.)
Siemens Brothers & Co. Ltd. (Siemens Electric Lamps & Supplies Ltd.)
St. Helens Cable & Rubber Co. Ltd.
Standard Telephones & Cables Ltd.
The Telegraph Construction and Maintenance Co. Ltd.

CABLE MAKERS ASSOCIATION
52/54 HIGH HOLBORN, LONDON, W.C.I. TELEPHONE: HOLBORN 7633



A GOOD NAME FOR STARTERS

METROVICK air-break star-delta starters

The Metrovick reputation is based on sound engineering design and good workmanship. The standard is maintained in the type ASD series of starters which conform with BSS.587. They are suitable for squirrel cage motors up to 25 H.P. 650 volts

Write for full technical details.

Type ASD starters are intended for use in general industrial applications.

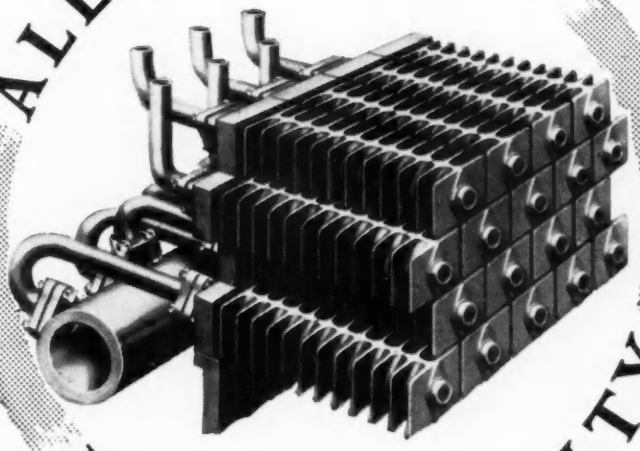
METROPOLITAN-VICKERS ELECTRICAL COMPANY LIMITED, TRAFFORD PARK, MANCHESTER, 17

Member of the A.E.I. group of companies

METROVICK *Control Gear for all Motor Drives*

H/A006

ALL ROUND ACCESSIBILITY



Type 12. Steel tubes with cast-iron gills: suitable for the highest pressures.

Green's Premier Diamond Economisers, Types 25 and 12, feature the famous gilled cast-iron tube or sleeve construction which permits better access for cleaning and all-round inspection of every part.

GREEN'S ECONOMISER

E. GREEN & SON LTD · WAKEFIELD

Makers of economisers for more than one hundred years

GE 104

Electrical Insulation

MICA

Washers
Plates
Commutator Segments
Stampings
Stove Plates
Heater Strips,
etc.

MICANITE

Mouldings, Commutator Vee Rings, Tubes, Covered Bars, Commutator Segments, Heater Strips. Sheet Material in Moulding, Flexible, Heat Resisting and Commutator Qualities, etc.

BAKELITE

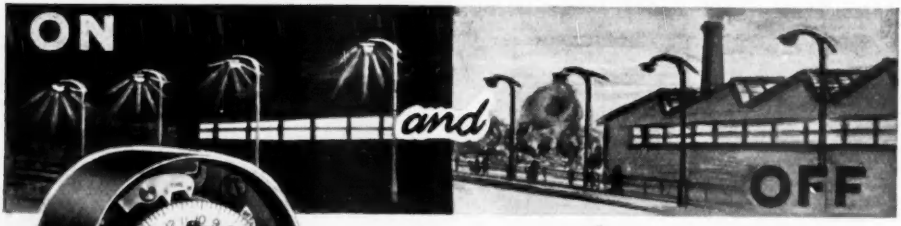
Tubes
Bushes
Bobbins
Washers
Stampings
Panels
Covered Bars,
etc.

Manufactured by

EAST LONDON MICA WORKS

RINGWOOD ROAD, WALTHAMSTOW, LONDON, E.17

'Phone: KEYstone 4254 *Telegrams: Elmicmer, Easphone, London*



You can leave it to

HORSTMANN

for Reliable **TIME SWITCHES**

Horstmann Electric Time Switches are renowned for their unfailing reliability. The comprehensive range covers hand wound models (15, 21 and 40 day run), electrically wound and synchronous models with or without spring reserve as required.

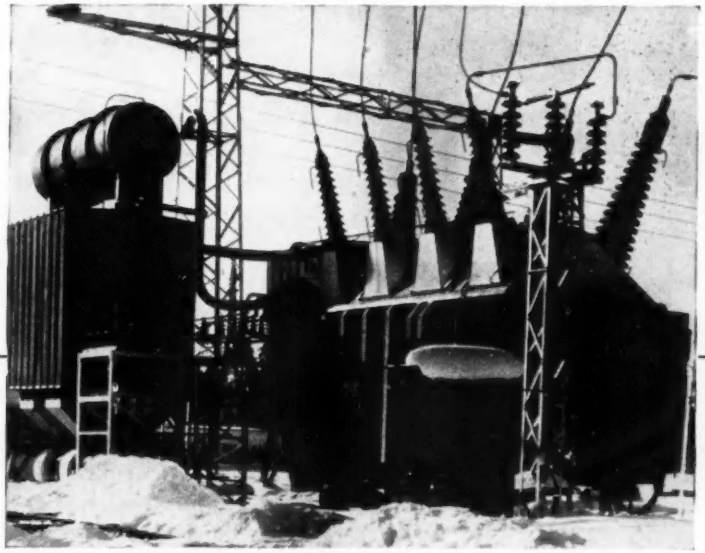
May we quote you for your requirements.

GRAMS: HORSTMANN, BATH
TEL: BATH 7241

THE HORSTMANN GEAR CO. LTD.

NEWBRIDGE WORKS • BATH • ENGLAND

220 kV transformers for Finland



The ENGLISH ELECTRIC Company is manufacturing two 64 MVA, 220 kV transformers for operation in Finland.
The illustration shows the first of these on its site at Petäjävesi.
The total weight of the transformers is 240 tons.
Their characteristics are: 64 MVA, three phase, 220/110 kV with fully insulated windings for arc-suppression coil protection, with an 11 kV tertiary winding supplying a synchronous condenser.

'ENGLISH ELECTRIC'
transformers

THE ENGLISH ELECTRIC COMPANY LTD., Queens House, Kingsway, London, W.C.2
Transformer Department, Stafford

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON
TH.5

PD

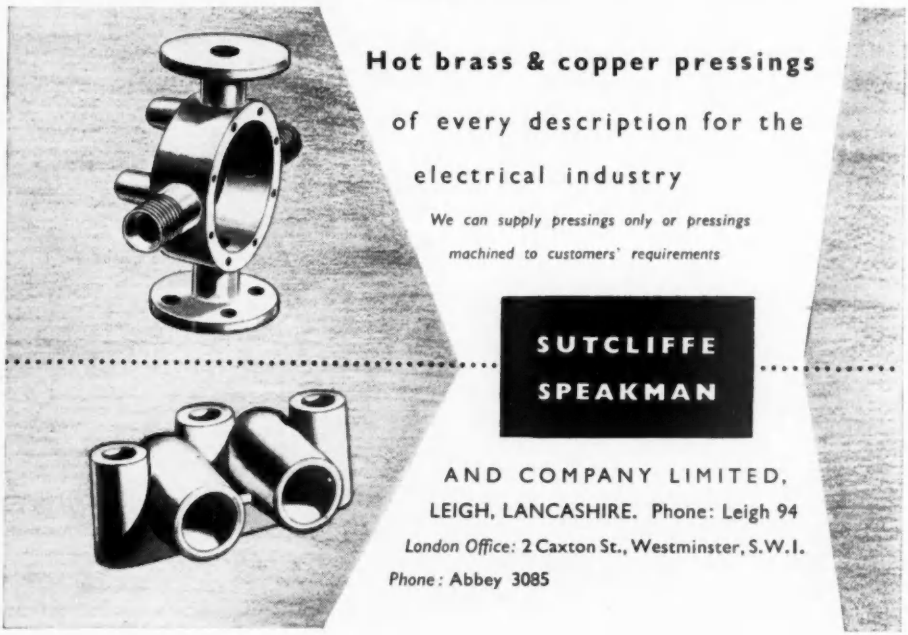
CARBON BRUSHES

Specify "P.D." brushes for electrical machines and apparatus of all types

Technical data on request to:—

POWELL DUFFRYN
CARBON PRODUCTS LTD
Electrical Carbons Division

SPRINGFIELD ROAD, HAYES, MIDDX. Telephone: HAYES 3994/8

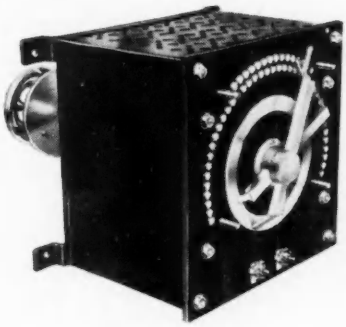


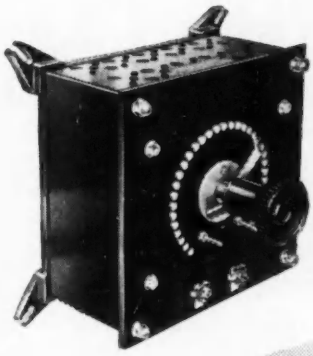
Birch

Registered Trade Mark

STUD TYPE RESISTORS

CONCENTRIC and F.O.B. TYPES





SLATE WOUND SLIDING RESISTORS

TUBULAR SLIDING RESISTORS

STUD TYPE RESISTORS

DIMMERS—STUD OR SLIDING TYPES

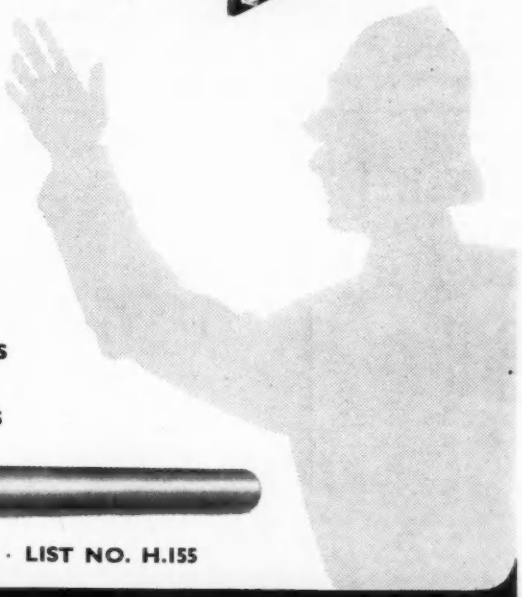
ASBESTOS WOVEN RESISTOR AND HEATING NETS

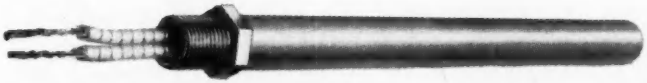
LOADING RESISTORS

CARTRIDGE AND STRIP HEATERS

MICA WOUND RESISTORS

PORCELAIN WOUND RESISTORS





CARTRIDGE TYPE HEATERS · LIST NO. H.155

H. A. BIRCH & CO. LTD.

Wilohm Works, Wood Street, Willenhall, Staffs.

Telegrams: "Wilohm," Willenhall · *Telephone*: Willenhall 494-495

London Office: 33, Sudbury Court Road, Harrow · *Telephone*: ARNold 2694

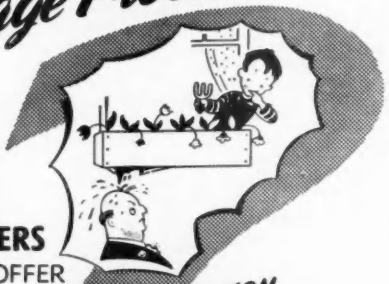
BR7

HAVE YOU AN

Earth Leakage Problem

CHILTON

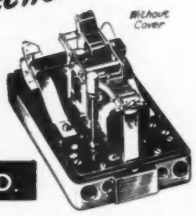
EARTH LEAKAGE CIRCUIT BREAKERS



OFFER YOU *POSITIVE PROTECTION* FOR

39/9

TYPE ELT "A"



OTHER MODELS	
ELT/B/30 with overload protection. full load current	30 amps £2 17 6
ELT/B/60 with overload protection. full load current	60 amps £3 9 6

FEATURES

★ Capacity: 0 to 60 amps
★ Robust Construction
★ Corrosion Free
★ Double Pole
★ Easily Installed
★ Free Handle

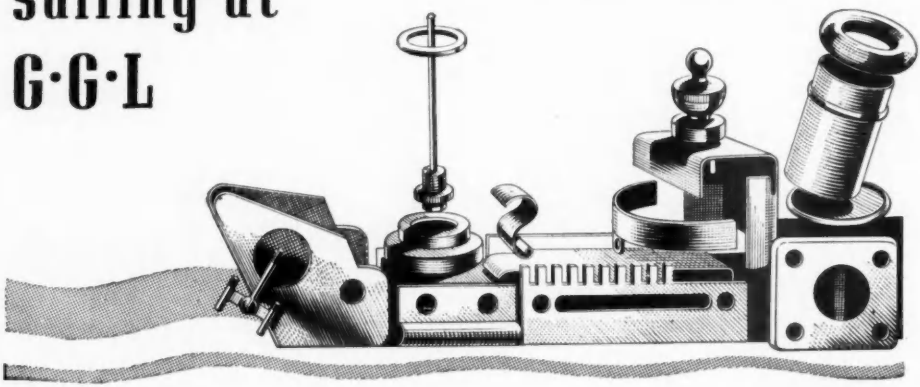
Full information with pleasure from . .

CHILTON ELECTRIC PRODUCTS LTD.

(Dept. ET6) HUNGERFORD, BERKS., ENGLAND

It's all plain sailing at G·G·L

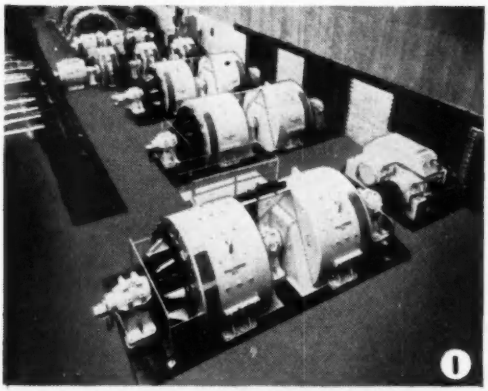
Modern machinery and methods keep capstan and automatic productions and sheet metal pressings flowing to you on time, at a price you will like.

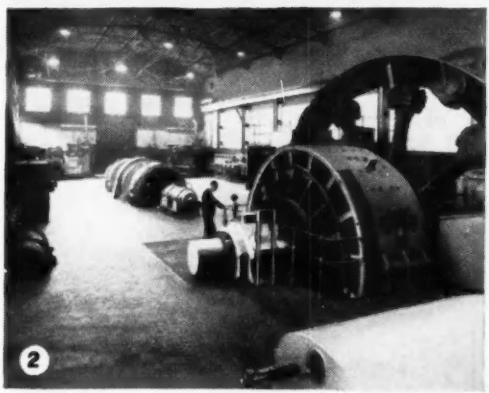


GRIFFITHS, GILBART, LLOYD & CO. LTD.
EMPIRE WORKS, PARK ROAD, BIRMINGHAM 18
Tel: NORthern 2132

G·G·L

Rolling Mill Equipment

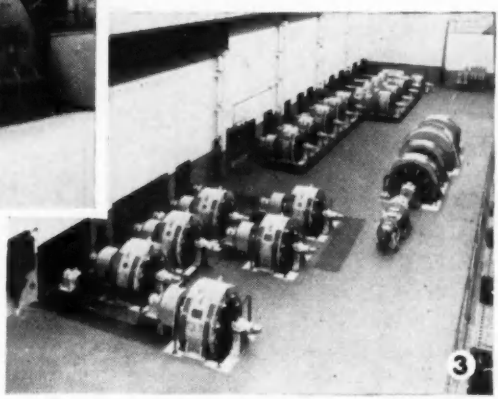




1 Three double-unit 2,600 horsepower D.C. motors with main and auxiliary motor generator sets driving a 66″ 3-stand tandem cold strip mill at the Rogerstone Works of Northern Aluminium Co., Ltd.

2 2,200 horsepower D.C. motor and motor generator set driving a Pilger seamless tube mill at the Clydesdale Works of Stewarts & Lloyds Ltd.

3 D.C. motors (totalling 6,850 horsepower) and motor generator set driving a Morgan rod mill at the Cardiff Works of Guest, Keen and Nettlefolds (South Wales) Ltd.



BTH manufacture electric equipment for all kinds of rolling mill machinery.

THE
BRITISH THOMSON-HOUSTON
COMPANY LIMITED, RUGBY, ENGLAND

Member of the AEI group of companies

A 4357

Announcing the Latest

Grubb

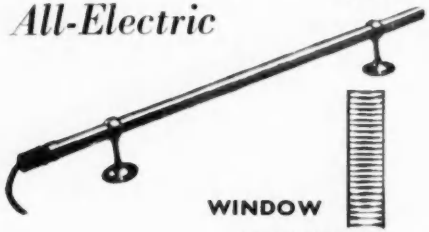
QUALITY PRODUCTS

750 watt BOILING RINGS

Supplied in Super-Chrome Finish

Also

All-Electric



WINDOW DE-MISTER UNITS

CONTACT YOUR WHOLESALER

or

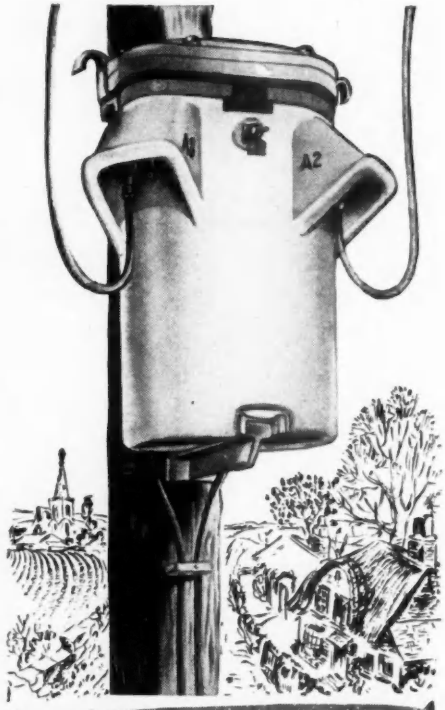
Write today for Price Lists, Brochures and Trade Terms to:

Sole Manufacturers:

GRUBB ENGINEERING CO. LTD.

Calthorpe 1006 and 1289 BIRMINGHAM 12

EXPORT ENQUIRIES INVITED



In any village — the best-behaved inhabitant!

These British Power Rural Distribution Transformers are *simple to install*, and *require negligible maintenance*. They are specially designed for Rural load factors, having short time overload capacity almost equal to that of a conventional transformer 50 per cent. larger yet they cost no more.

Please write for Leaflet BP3012

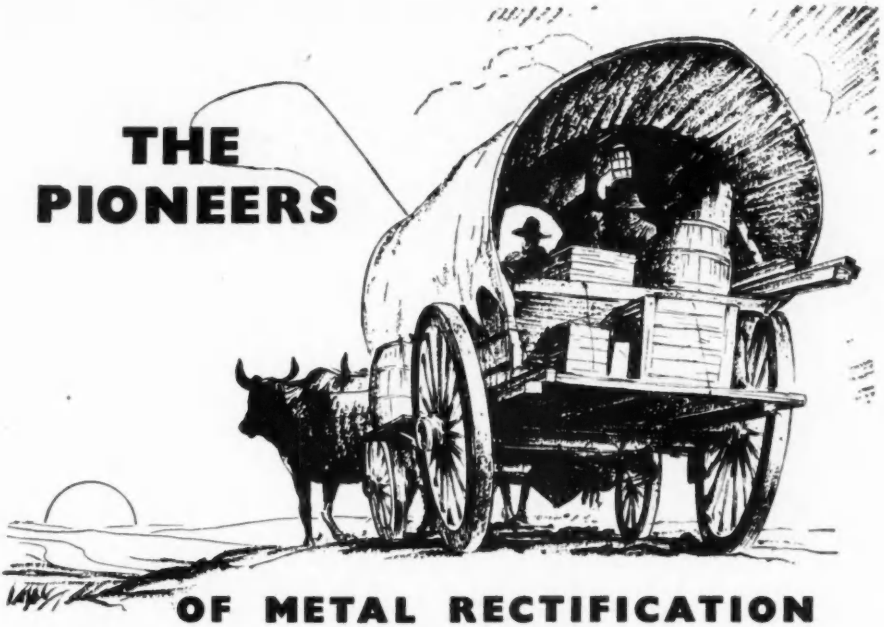
RURAL DISTRIBUTION TRANSFORMERS IN HERMETICALLY SEALED STONEWARE CONTAINERS

BRITISH POWER

British Power Transformer Co. Ltd.
Queensway, Ponders End, Middlesex
Telephone: Howard 1492 Telegrams: "Vitrohm, Enfield"

BP3012-CV1

THE PIONEERS



OF METAL RECTIFICATION

will be at the

RADIO

EARLS COURT SHOW
Aug. 26th - Sept. 6th

and

SBAC

EXHIBITION
FARNBOROUGH Sept. 1st-7th

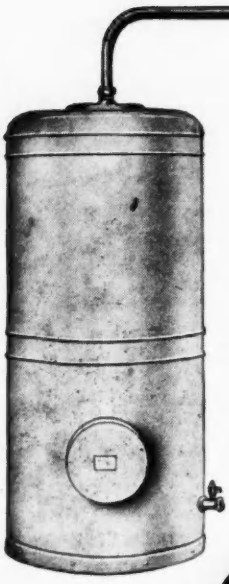
FROM the time in the late 1920's, when our copper-oxide rectifiers first appeared on the market, with performances that made electrical engineers metal rectifier minded, our development has made tremendous strides. The "Westalite" selenium compound rectifier, which we produced in the 1930's superseded the copper-oxide type for power application, and has received Type Approval, for both single- and double-voltage units. Rectifiers for operating in ambient temperatures of 70° C, and a new light-weight rectifier for D.C. power supplies on aircraft giving an output of 1 kW for every 1.6 lb. of rectifier, bus bars and housing, have now been produced, together with the "Transbooster", a new constant potential rectifier. But why not visit us at these Exhibitions where we are . . .

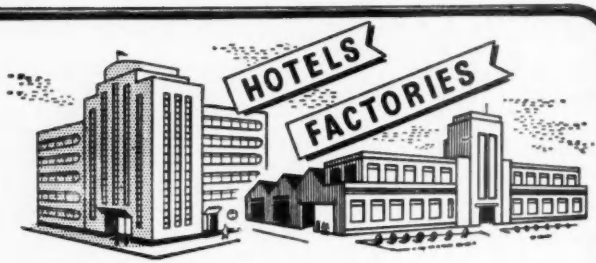
showing the latest developments of

WESTINGHOUSE

METAL RECTIFIERS

WESTINGHOUSE BRAKE & SIGNAL CO., LTD.
82 YORK WAY, KING'S CROSS, LONDON, N.1





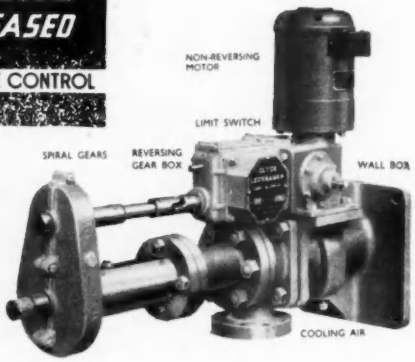
Wherever large quantities of hot water are required — install a "Dunlow" Electric Storage Tank

Heavy gauge copper construction, lagging protected by large steel casing or suitable for lagging on site. Kilowatt loading to meet requirements

DUNCAN LOW LIMITED
293 Bell Street, Glasgow C.4

"Dunlow"

Clyde SOOT BLOWERS
BOILER AVAILABILITY INCREASED
ELECTRO-MECHANICAL OPERATION with SEQUENCE CONTROL



Improvements Over Manual Operations

1. No physical exertion required.
2. Soot blowing carried out in a quarter of the time.
3. Shorter period of abnormal combustion conditions.
4. Cleaner heating surfaces with higher and sustained rate of evaporation.
5. Saving in fuel and labour costs.
6. Increased boiler availability.

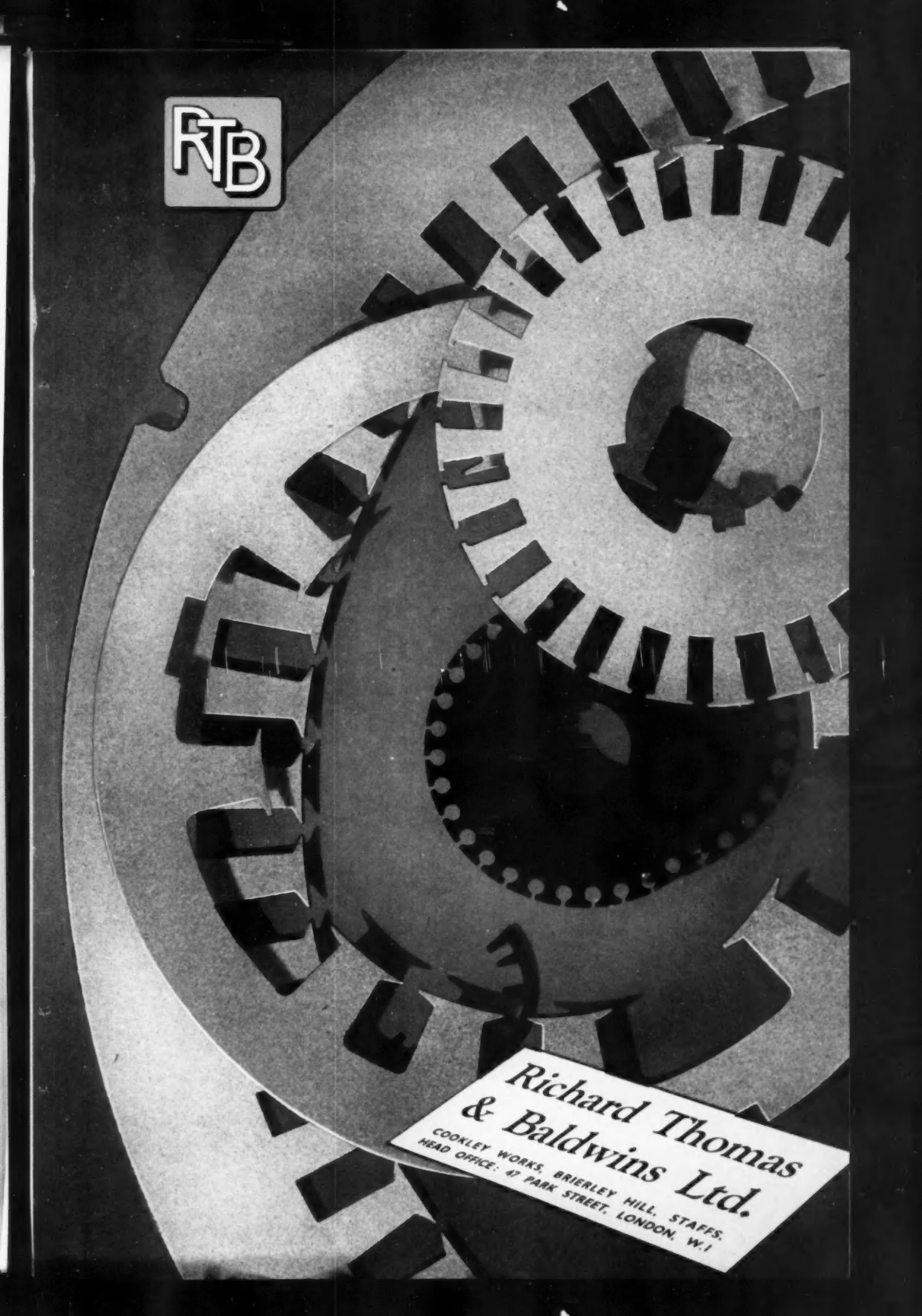
London—
34 VICTORIA ST., S.W.1
Telephone: **ABBEY 1847**

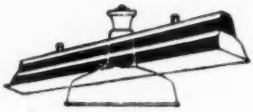
Manchester—
1 CHANCERY LANE, SPRING GARDENS
Telephone: **DEAnsgate 4262**

★

Clyde BLOWERS Ltd

LIVINGSTONE STREET, CLYDEBANK
'Phone: CLYDEBANK 1576/77 'Grams: 'MURWILS, GLASGOW'


RTB
Richard Thomas
& Baldwins Ltd.
COOKLEY WORKS, BRIERLEY HILL, STAFFS.
HEAD OFFICE: 47 PARK STREET, LONDON, W.1



Leadership...

With leadership comes responsibility—the obligation to maintain a standard of excellence that is accepted automatically as the best. There can be no finer example of this constant adherence to quality than the continued preference for BENJAMIN Lighting Equipment. Whatever the need—whether for indoor or outdoor lighting—it is always . . .

Better by

BENJAMIN REGD.

THE BENJAMIN ELECTRIC LTD

(*Established* 1908)

Brantwood Road, Tottenham, London, N.17

Telephone : Tottenham 5252 (5 *lines*)
Telegrams : "Benialect, Southtot, London,"

BIRMINGHAM
5, Corporation St., Birmingham, 2
Midland 5197

LEEDS
49, Basinghall St., Leeds, 1
Leeds 25579

specify McKECHNIE
EXTRUDED RODS and SECTIONS

McKechnie Extruded Brass and Bronze Rods and Sections are available in an almost limitless variety of shapes and sizes. Their use increases output, reduces or entirely eliminates machining, saves tools and labour. For further information, *please write to McKechnie Brothers Ltd., 14 Berkeley Street, London, W.1.*

★ *See our Exhibit at the London Building Centre, Store Street, London, W.1.*

McKECHNIE
metal technique

McKECHNIE BROTHERS LIMITED

Metal Works: Rotton Park Street, Birmingham 16. Branch Offices: London, Leeds, Manchester, Newcastle-on-Tyne. Solder Works: Stratford, London E.15. Copper Sulphate and Lithopone Works: Widnes, Lancs. Enquiries for Lithopone and Solder to: 14 Berkeley Street, London W.1 South African Works: McKechnie Brothers S.A. (Pty) Ltd. P.O. Box No. 382, Germiston, S.A. New Zealand Works: McKechnie Brothers (N.Z.) Ltd., Carrington Road, New Plymouth.

G.55

ESTABLISHED 1840

ATTWATER & SONS

HOPWOOD STREET MILLS,
PRESTON.

MICA & MICANITE

IN ALL FORMS & QUALITIES.

BAKELITE SHEETS · TUBES · BOBBINS · VARNISH AND ROSIN
FOR OIL SWITCH GEAR & TRANSFORMERS

VULCANISED FIBRE SHEETS, TUBES AND RODS.

PEERLESS **LEATHEROID** INSULATION.

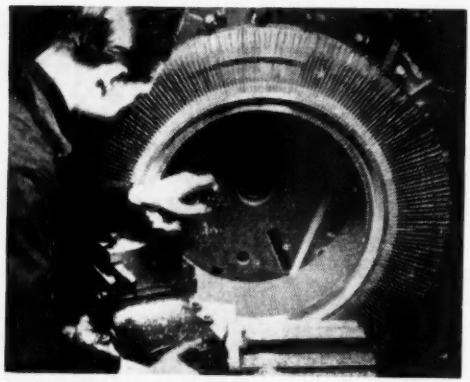
BAKELAQUE INSULATION
WHILE I LIVE I'LL CROW
BEST TRADE MARK
BEST BRITISH MANUFACTURE

Cotton and also Asbestos Dynamo Tapes.

Presspahn and Fullerboard In Sheets and Rolls.

Empire Cloth and Tapes

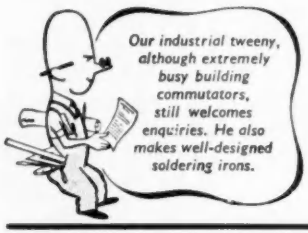
Ebonite and all Insulating Material for Electrical Engineers.



Turning copper segments to fit cones for a commutator of ship's generator for M.V. "Kronprinsessan Margerets".

GRAngewood 4003 (4 lines)

When electrical equipment gives trouble is the time to 'phone Browning's. Now is the moment to note their number. Browning's have specialised in electrical repairs for over 30 years and they work for many "industrial giants" in all parts of the country. They really do understand your urgency for quick efficient work.


Our industrial tweeny, although extremely busy building commutators, still welcomes enquiries. He also makes well-designed soldering irons.

BROWNING'S ELECTRIC CO. LTD.

BOLEYN CASTLE · GREEN STREET
UPTON PARK · LONDON · E.13

TELEPHONE: GRANGEWOOD 4003 (4 lines)

SIERAY
BRITISH MADE

Fluorescent Lighting Equipment

KNOWN ALL ROUND THE WORLD

Look for this mark on the NEW

SIERAY
FLUORESCENT
CIRCLES

There is a SIEMENS *LAMP*
for every lighting purpose

MADE THROUGHOUT IN ENGLAND

SIEMENS ELECTRIC LAMPS AND SUPPLIES LIMITED, 38/39 Upper Thames Street, London, E.C.4
Branches at Belfast, Birmingham, Bristol, Cardiff, Dublin, Glasgow, Leeds, Liverpool, Manchester, Newcastle-on-Tyne, Nottingham, Sheffield.

G.E.C. Enclosed Sodium Lantern

for Main Road Lighting

The lantern has been designed for main road lighting using an 85 watt or 140 watt OSRAM Sodium lamp. Space is provided within the lantern body to house the auxiliaries necessary to operate the lamp. Among the many outstanding features of the lantern are:—

- Lamp operating gear housed within the lantern body providing a convenient and economical arrangement where it is desired to make use of existing columns which may have no base accommodation for this.
- Optical system comprising specially designed "Perspex" refractor plates.
- Prismatic sides of refractors sealed on the inside of totally enclosing "Perspex" bowl.
- Smooth interior and exterior surfaces for ease of cleaning.
- Easy access to interior for cleaning and lamp renewal by quick release stainless steel toggle catches and stainless steel hinged supporting ring.
- Single piece die-cast aluminium alloy body supplied either for side entry or top entry fixings.

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

ELECTRICAL TIMES

Vol. 122 No. 3173 THURSDAY, 28 AUGUST, 1952

PUBLISHED EVERY THURSDAY

SIXTY-FIRST YEAR OF PUBLICATION

INDUCTION MOTORS FOR FAN DRIVES, *by R. H. Young, B.Sc.(Eng.), A.M.I.Mech.E., A.M.I.E.E., A.M.I.H.V.E.* 347
ELECTRIC POWER FROM THE ATOM .. 352
OUR READERS' VIEWS .. 353
U.S.S.R.—THE LATEST FIVE-YEAR PLAN .. 354
ALUMINIUM SHEATHS FOR WIRING CABLES .. 354
THE LYNMOUTH DISASTER .. 355
LAMINATED WOOD INSULATORS .. 356
ACCIDENTS AT NIGHT .. 357
NEW HIGH TEMPERATURE ALLOY .. 358
ELECTRICITY PRICES RISE IN BELFAST .. 358
THE 19TH RADIO SHOW .. 359
PROBLEMS AND PRACTICE IN ENGINEERING .. 361
ESCOM IN 1951 .. 362
STARTER SWITCH OR QUICKSTART? *by W. A. Stickley* .. 363
TELLING THE PUBLIC .. 366
EXPORTS AND IMPORTS .. 367
OVERSEAS NEWS .. 368
PERSONALITIES IN THE INDUSTRY .. 370
PAMETRADA PROGRESS—1951 .. 372
SUPPLY AND UTILISATION .. 373
THE BUYER'S COLUMN .. 374
FERGUSON "500" FOR QUALITY SOUND .. 375
NEW LITERATURE .. 376
THE WEEK IN NEWS .. 377
Company Activities .. 381
Electric Supply News .. 383
COMMERCIAL INFORMATION .. 384
CLASSIFIED ADVERTISEMENTS .. *51*
INDEX TO ADVERTISERS .. *58*

SUBSCRIPTION RATES.—United Kingdom and Overseas £2 10s. 0d. per annum. Canada C$7·50c., U.S.A. $7·50c. per annum. Subscriptions are payable in advance and may commence with any issue throughout the year. Overseas subscriptions may be paid to The Electrical Times Limited by banker's draft, cheque or international money order. Single copies 9d. each

OFFICES — SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
Telephone - HOLborn 6016 Telegrams - Equivolt, Estrand, London

Wherever G.E.C. "Fractionals" are at work, the factory buzzes like bees in a field of clover. No snags, no breakdowns, thanks to the reliable G.E.C. pedigree of these busy-bees. If you want your factory to be a hive of industry, you'd better instal G.E.C. "Fractionals".

G.E.C.

"Fractionals"

THE GENERAL ELECTRIC CO., LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2.

Editorial

THE WORTH OF 1%

THE economics of the supply industry are largely based on continuously increasing consumption, and when the expected year by year growth receives a check, there must inevitably be serious financial repercussions. An estimate of the magnitude of this effect may be made by considering the cost of bulk supplies to area boards in 1950-51, and the amount they charged for the energy sold. On this basis, a decrease of 1% in units sold means an aggregate loss of £800,000 to the fourteen boards. This estimate necessarily assumes that area costs remain unaffected, and that the load factor is constant. In considering the likely results of a change in output at any time, it must be remembered that neither of these conditions necessarily apply, for there will usually have been an increase in working costs and in apparatus installed, and there is a strong possibility that the load factor may have worsened. In the supply industry, as with every other large business, it is the last marginal sales that determine the difference between profit and loss. With financial surpluses in recent years of the order of millions of pounds only, it is clear that the B.E.A. is in danger of making a deficit if the usual rate of load growth is not regained. We hope and believe that the falling-off in growth is but a temporary phase; but to ward off any possible resultant increase in tariffs, an energetic promotional campaign is urgently necessary.

CONFERENCE EXCHANGE

CONFERENCES are a feature of engineering life today which makes an increasing demand on the time of the industry's leaders in the summer months. Their worth, both in terms of technical knowledge imparted and acquaintances made has been demonstrated many times; to quote Mr. J. Simpson, whose letter appears elsewhere in this issue, they provide a link in the industry that cannot be forged by any other means. Yet that link might be strengthened by greater regard on the part of organisers of such events for those other gatherings which their guests and delegates will be called upon to attend. It is improbable that any secretary or chairman of an organising committee will ever be persuaded that his particular charge should take second place to another. Nevertheless, if the suggestion of talks in the early stages of planning be adopted, then a comfortable working arrangement may be reached with honours even all round. The possibility of an improvement in conference facilities as a result of an exchange of experiences is another factor which the peripatetic delegate finds attractive in this idea of a convention on conferences. No doubt the difficulties in bringing co-operation in this field to a high level are considerable, but Mr. Simpson's offer is greatly to be commended, and, it is to be hoped, approached in a hopeful and helpful spirit.

CENTRIPETAL NATIONALISATION

ACTIVE politics are fortunately not our concern, but when their impact on the supply industry threatens its well being, we must watch with wary eye. Consequently we deplore the suggestion of a Minister of Public Industry made in a recently issued pamphlet of the Labour Party. This envisages the pooling of all finance in one fund and so long as this balanced one year with another there would be less concern if any particular industry operated at a loss. As an expanding industry of greater financial stability than most other nationalised boards, there is little doubt of the part that electricity supply would play in such a set-up. It would not be the first

time in its history that it has been made to play the part of a milch cow, but having gained its freedom from contributions to local rates, let no fresh pipe lines be laid on. Fortunately, the idea need not be taken over seriously for it is expressly stated that the pamphlet is not to be regarded as official policy. None the less ideas are dangerous weapons and the sooner such views are scotched the better.

FLOOD SUPPLY

IN the long tale of destruction caused by the floods in Devon, the inclusion of the Lynmouth generating station amongst the ruined buildings calls for special comment because of the many unique features of the installation which has now been swept away. A description of this plant, the survivor of what is stated to be the second oldest hydro-electric station in England, is given on another page. With its remarkable history of the early use of pumped storage, and its continued operation at a non-standard frequency so far into this century, the station held a special interest for electrical engineers. In 1897, a contemporary reference book recorded that, with alternators driven by Pelton wheels, and lead-covered rubber cables run in pipes used for distribution purposes, the undertaking supplied "some 2,000 lamps." More were extinguished in the recent disaster, but it is pleasing to be able to record that the traditions which were being built up in the supply industry in those early days were most worthily upheld at the Lynmouth station to the last. Mr. Postles' efforts to keep his station running were not the least of deeds of quiet courage on that dreadful night. They do a service to the industry that deserves the appreciation of all supply engineers, as do the prompt arrangements made by the South Western Electricity Board for the restoration of supply and the subsequent erection of a new system.

ANOMALIES IN THE COLD

THAT most metals decrease in resistivity as temperature falls is one of the facts of electrical technology which the engineer gratefully accepts as fixed and unvarying. Indeed, he knows that with certain metals, when temperatures fall to within a few degrees of absolute zero, the resistance drops extremely rapidly to a negligible value, so that a super-conductive condition is reached in which induced currents will continue to flow for several hours. Recent work in this strange world of intense cold is showing, however, that the opposite effect may occur as well. Metals such as gold, silver and magnesium, after decreasing in resistivity all the way down the temperature scale to 20° absolute or lower, suddenly become more resistive as the temperature is lowered further. Explanations of this inversion in terms of molecular arrangement and electron structure are still being sought, but the discovery reminds one of the real uncertainty of even the most cherished of scientific convictions.

INVERTED TEMPERATURES

TEMPERATURE effects sometimes produce unexpected results outside the laboratory as well. The idea that warm weather means a decrease in the demand for electricity is usually accepted in supply circles, but it is not safe to extend this result of British experience too far round the world. An extreme example of its not applying came recently from the United States of America. There, in spite of a steel industry strike that reduced demand both in the steel plants themselves and in dependent factories, the total sales of electrical energy stayed well up to expected values. Commentators searching for an explanation of this surprising result were forced to the conclusion that it was a measure of the great advances made in the installation of electrically operated air-conditioning plants in the States. The weather during the strike was hot; in consequence, the load imposed by the desire to keep cool was sufficient to blanket the main effect of an industrial disturbance. The incident provides yet another neat example of the way in which the domestic load can smooth out the worst effects of a loss of industrial demand.

Meteor

Induction Motors for *FAN DRIVES*

Power characteristics vary with the fan and speed control requirements

By R. H. YOUNG, B.Sc.(Eng.), A.M.I.Mech.E., A.M.I.E.E., A.M.I.H.V.E.

WHILE all fans obey certain laws relating performance and power input to such variables as rotational speed and air density, changes in conditions in the air circuit may affect the behaviour of fans in varying manner according to their type. The most varied characteristic is the relationship of power input to air volume and hence also to fan pressure. Some knowledge of the constant speed characteristics of the various types of fan is therefore necessary if electric drives are to be satisfactorily applied.

Fans in general use fall in one of three main categories. These are centrifugal, axial flow and propeller. The last two classes differ in that the axial-flow fan has an impeller working in a closely fitting cylindrical casing, whereas the propeller fan is normally designed for operation in an orifice or ring, and makes some use of centrifugal forces on the air, in addition to the lift forces obtained from an inclined blade or aerofoil. This distinction is important, as the power input characteristics of the two fans are very different indeed.

Fan Types

Axial-flow fans take many forms: some have up-stream or down-stream guide vanes; some may be multi-stage; some may even have contra-rotating impellers. As regards power input characteristics, all these designs are generally similar and one typical curve will be satisfactory for the purpose of considering power requirements. On the other hand, the three main types of centrifugal fans have widely differing power characteristics. The types in question are: (*a*) forward curve; (*b*) radial; (*c*) backward curve or backward slope. These terms actually describe the form of the impeller blading (with particular reference to the shape near the tips).

Forward-curve centrifugal fans, which are very frequently used for ventilating and air-conditioning duties, have a horse-power characteristic which rises with increase of volume and therefore with decrease in resistance to flow. This is shown in Fig. 1, which indicates that the power taken with no volume (fully throttled conditions) is less than 20% of the power taken at full volume (no resistance in the air circuit). The fan should, of course, be designed and/or selected so that it normally operates near its point of maximum efficiency. For the forward curve fan this point corresponds roughly to 45% of maximum free air volume. Even so, should the resistance of the air circuit be less than anticipated, or reduced by opening dampers, there may be a rise in the horse-power required, up to a maximum of three times normal. For these reasons it is sound practice to have a large margin in motor power when forward-curve fans are being used.

The constant-speed power characteristic of radial (bladed) centrifugal fans is somewhat similar to that of forward-curve fans, but the rise is not quite so pronounced. Radial fans are frequently used for such duties as induced draught on boilers, and pneumatic dust and refuse collection. These duties usually entail variations in air circuit resistance, and here again the rating of the driving motor must be liberal enough to take care of any possible reduction in the resistance of the air circuit.

The backward-curve and backward-slope centrifugal fans are commonly referred to as having a "non-overloading characteristic." Fig. 2 shows that the maximum horse-power which can be absorbed is only a few per cent above the power required at the point of maximum efficiency. In this case, therefore, only a comparatively small margin in power is necessary when determining the rating of the driving motor.

As far as the power characteristic is concerned, axial-flow fans are very similar to the backward-bladed centrifugal machines. Fig. 3 shows that there is little difference between the maximum power that can be absorbed and the power required when the fan is operating at maximum efficiency.

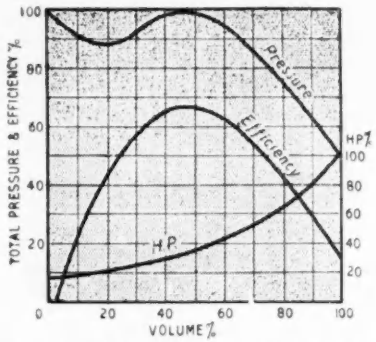


Fig. 1.—Operating characteristics of forward-curve centrifugal fan

An orifice mounted propeller fan has a power characteristic of entirely different form from those of other fans. The slope of the curve is reversed in comparison with that of the curves for the first two types of centrifugal fan described (see Fig. 4). This means that on throttling down the air flow, the horse-power rises. As frequently the air flow is relied upon for motor-cooling purposes, it will be seen that motor heating may easily become excessive with increase of air resistance, unless the motor be very liberally rated.

While it may be dangerous to rely, for motor-sizing purposes, on any simplified formula, it may be advantageous to the electrical engineer if he can make a rapid preliminary calculation of the approximate rating of a motor required to drive a fan. For this purpose the following formula may be used:—

$$\text{b.h.p.} = \frac{\text{FTP} \times \text{Q}}{\text{K}}$$

Where FTP = Fan total pressure in in. water-gauge; Q = Thousands of cu ft of air per min.; K = 3·0 for forward-curve and radial centrifugal fans, and 4·5 for backward-bladed centrifugal fans and axial-flow fans.

Example

An axial-flow fan is rated at 9,000 cu ft per min at a fan total pressure of $1\frac{1}{8}$ in. water gauge. Approx. b.h.p. $= \frac{1{\cdot}5 \times 9}{4{\cdot}5} = 3$.

These approximate formulae are based on the fundamental relation:—

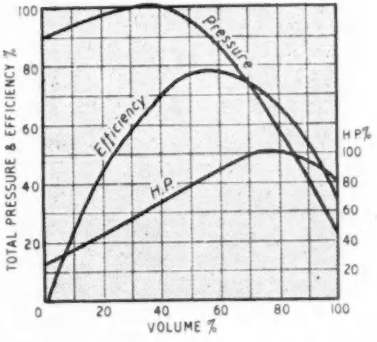
$$\text{B.h.p.} = \frac{5{\cdot}2 \times \text{FTP} \times \text{cfm}}{33{,}000 \times \eta} = \frac{\text{FTP} \times \text{cfm}}{6{,}346 \times \eta}$$

Where η = efficiency (total head) of fan, and 5·2 = factor for converting a pressure in in. water-gauge to lb/ft².

In view of the steeply rising h.p. characteristic of forward-curve and radial centrifugal fans, the application of this fundamental formula may be dangerous in these cases unless there is confirmation that the fans will be operating exactly at the designed volume, pressure and efficiency. Even should there be no risk at any time of reduced back pressure (and hence increased volume) in the case of these types of fan a margin in power should be allowed to cover drive losses.

No simple guide can be given to the sizing of propeller fan motors. In addition to the complication of a rise in power coinciding with a reduction in cooling air, should resistance be increased, these fan motors are frequently

Fig. 2.—Operating characteristics of backward-curve centrifugal fan



designed with high internal losses to allow for a special form of speed control (q.v.).

Starting and Running-up

The electrical engineer usually regards a fan load as the easiest type of load to start. The fan law, b.h.p. $\propto$ r.p.m.^{3}, gives the relation, torque $\propto$ r.p.m.^{2}, but neglects the effect of bearing friction or other frictional torques in the drive. However, these frictional torques are normally very small, as the typical fan (in contradistinction to the typical pump) is not fitted with glands.

The very small resistive torque at start suggests the use of squirrel-cage induction motors with star-delta starting. While it is true that fans can be started effectively in this manner, the British Electricity Authority may object to the use of this method for other than quite small powers, while accepting auto-transformer starting with a tapping at start considerably in excess of the $57\frac{1}{2}$% corresponding to star connection.

The reason for objection to star-delta starting is due to conditions at the point of changeover from star to delta. This changeover will normally take place at such a point on the motor torque speed curve that the motor is temporarily "stalled" in delta. The resultant current "kick," though of comparatively short duration, will therefore be almost as great as that obtained with direct-on starting. The relevant torques from standstill to full load speed are indicated in Fig. 5.

Power-station Fans

Power-station auxiliaries such as forced and induced draught fans are usually driven by squirrel-cage motors, and since current and voltage "kicks" are of little importance on "house" alternator circuits, these motors will usually be thrown on the line, though several hundred horsepower may be involved. The use of two-speed motors (as is usual) permits of a reduction in initial starting current due to the smaller power and larger number of poles of the low-speed winding. The changeover

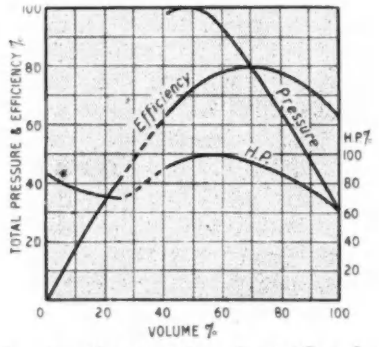


Fig. 3.—Characteristics of axial-flow fan

from low-speed to high-speed windings is somewhat similar, as regards final accelerating torque conditions, to the changeover from star to delta described earlier.

High-pressure blowers, or fans having a high-pressure development in relation to their volumetric output, frequently have narrow (axially) and large diameter impellers. The high inertia of the impeller may result in a prolonged running-up period, necessitating special time lags or restraining devices on the starter overload protection mechanism.

If the torque/speed or torque/slip characteristic of the motor, and the polar moments of inertia of the rotating parts, are known, the time required for acceleration can be computed for a direct-driven fan without great difficulty, viz.:—

$$\tau_a = J\frac{d\omega}{dt}$$

$$\therefore t = J\int\frac{1}{\tau_a}\,d\omega$$

$$= 2\pi J\int_0^{n'}\frac{1}{\tau_a}\,dn$$

$$= \frac{2\pi J}{60}\int_0^{N'}\frac{1}{\tau_a}\,dN$$

where t = time for acceleration (secs.)
J = polar moment of inertia (fan impeller, motor rotor and other rotating masses).
τ_a = torque available for acceleration.
n, n' = r.p.s. and full load r.p.s. respectively.
N, N' = r.p.m. and full load r.p.m. respectively.

J and τ_a must be in consistent units, e.g., J in slug ft^2 and τ_a in lb—ft.

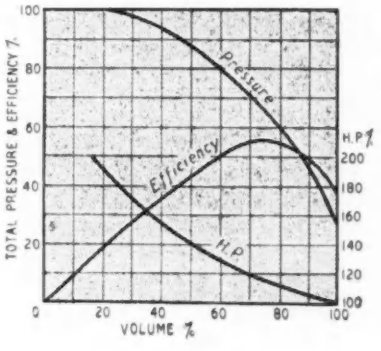
The torque available for acceleration at any point between standstill and full load speed is represented by the ordinate between the fan torque curve and the motor torque curve (see Figs. 5 and 6). The only method of solving:—

$$\int_0^N\frac{1}{\tau_a}\,dN$$

is to plot $\frac{1}{\tau_a}$ against N and find the area embraced by this new curve by applying Simpson's rule or the mean ordinate method, or by use of a planimeter.

In the case of forward curve and radial centrifugal fans and, to a lesser extent, for backward bladed centrifugal machines, the time for acceleration to full speed can be reduced by closing fan inlet or outlet by means of a damper.

Fig. 4.—Operating characteristics of orifice mounted propeller fan



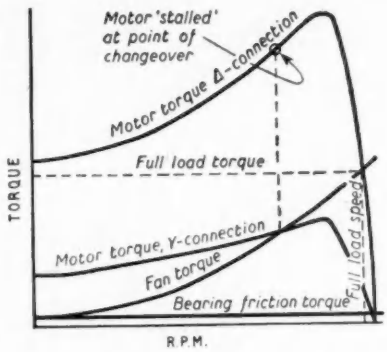


Fig. 5.—Torque-speed relationship for star-delta starting of an induction motor

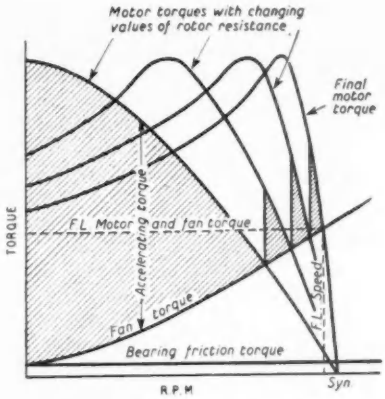


Fig. 6.—Accelerating torque-curves for a slip-ring motor with star-delta starting

Speed Regulation

In the majority of fan applications some form of volume control is desirable. While the large power station centrifugal fans referred to may utilise inlet control vanes for some degree of volume control, and mines fans of the axial flow type may be fitted with adjustable pitch impellers, some form of speed control is generally necessary to provide any appreciable range of volumetric displacement through a given air circuit.

The advantage of fan speed control lies in the ability to maintain constant (and normally, maximum or peak) fan efficiency, irrespective of the air volume moved through a given air circuit. This follows from the relations:—

For fan: Volume $\propto$ r.p.m.; pressure $\propto$ r.p.m.^{2} (for constant point of operation or constant fan efficiency).

For air circuit: Pressure $\propto$ volume^2.

While it is true that the last relationship is only approximate when the pressure drop in the air circuit is mainly due to skin friction (rather than to shock losses), it is an accurate enough basis for most fan work.

The effect of a change in speed (r.p.m.) is shown in Fig. 7, in which both pressure and fan efficiency is plotted against volume. At each speed the pressure and volume actually obtained is that represented by the intersection of the fan pressure/volume characteristic with the circuit pressure/volume characteristic. It will be seen that the volume obtained at either speed is obtained under peak efficiency conditions.

Fan-speed control is sometimes effected by means of hydraulic or electro-magnetic couplings interposed between motor and fan. Since these are slip couplings, providing no torque conversion, the losses at, say, 50% speed equal the power transmitted to the fan. However, at 50% speed, the fan requires approximately 12½% of full load power only. As a percentage of the latter, therefore, the losses are not excessive. An advantage of slip couplings when used in conjunction with squirrel cage induction motors is that starting and running-up to any speed can be effected by controlling the coupling fluid or excitation, with the motor running at full speed (the motor having been started up "light").

The use of a slip-ring induction motor with rotor resistance control provides a means of speed control which, as in the case of the slip coupling, is reasonably efficient on a fan load. In fact, the similarity between the two forms of speed control is very marked, as will be shown later.

First, considering the balance of fan and motor torques, Fig. 6 may be taken to illustrate the effect of running the motor with external rotor resistance left in the rotor circuit. Continuously rated resistances of suitable values will produce any such motor torque/speed curves as are shown to the left of the normal curve. Quite high values of rotor resistance will be required for the lower speeds, but increase of rotor resistance is accompanied (on a fan load) by rapid fall in rotor current.

Since the rotor current is proportional to torque, and rotor volts can be taken as proportional to slip, it can be shown that the rotor losses are proportional to:—

$$\text{r.p.m.}^2\,(1-\text{r.p.m.})$$

Further, since the fan power (neglecting

bearing and other frictional losses) is proportional to r.p.m.[3] the input to the motor is proportional to r.p.m.[2].

By differentiating the loss in respect to r.p.m. and equating to zero (thereby finding the conditions for minimum rate of change of loss), it can also be shown that the maximum loss takes place at two-thirds of maximum speed, and is approximately 15% of full load power. These are virtually the loss conditions for a slip coupling.* Again the loss at 50% speed will be seen to be 12½% of full power.

Line Voltage Control

There is available another method of speed control which has the advantages of simplicity and low capital cost. A rather poor efficiency, which is an inherent factor, normally limits the use of this method to comparatively small fans (usually of the propeller type).

The principle involved is that of regulating squirrel cage induction motors by line voltage control. This, of course, is only feasible on a fan (or similar) load where the torque falls rapidly with speed. While some degree of speed control could be obtained in this way, and on such a load, with a standard design of squirrel cage motor, the performance would be extremely poor, as regards efficiency and power factor, on the regulated speed. Moreover a reasonable speed reduction would require an excessive drop in line volts, bringing in train acute instability of operation.

By reference to Fig. 8 it will be seen that a standard squirrel cage motor with 70% of normal line volts on the starter gives a comparatively small speed reduction, while a drop to 50% line volts causes the motor to stall. Moreover, at such a voltage the motor torque and fan torque curves are nearly parallel and the point of intersection will be somewhat indefinite. Not only will the actual point of operation be indeterminate, but there is likely to be considerable surging and generally erratic operation.

By specially designing the motor with a high internal rotor resistance/rotor reactance, a new family of motor torque curves (shown by broken lines in Fig. 8) is obtained. With such a machine effective speed reduction can be obtained with line volts of 50% of normal, or less. The increased losses, due to increased rotor resistance, will call for a machine of larger than normal dimensions, if a satisfactory temperature rise is to be maintained.

The methods used for obtaining reduced line volts include rheostats, tapped chokes, and auto-transformers. Though the latter are to be recommended for the larger three-phase motors, the tapped choke in itself has small losses and, particularly for single-phase machines, can be made in much smaller dimensions than the equivalent rheostat.

Another advantage of the tapped choke lies in its ability to preserve and improve the phase displacement of the two windings of a single-phase capacitor motor. Fig. 9 shows an effective connection wherein the tapped choke is in

** It is perhaps worth while drawing attention to a slight difference between the two forms of speed control, indicated by the fact that, at full fan speed with slip couplings there will be a small slip (2% approx.), representing a loss of the same magnitude, which is not present with a motor arranged for rotor resistance control.*

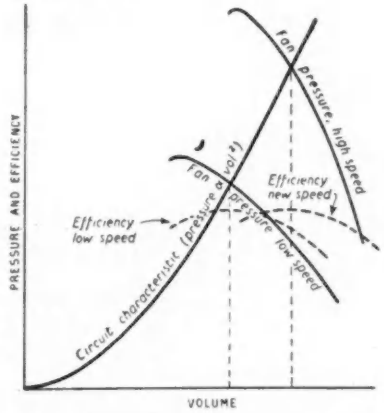


Fig. 7—Effects of change of speed on fan pressure and efficiency

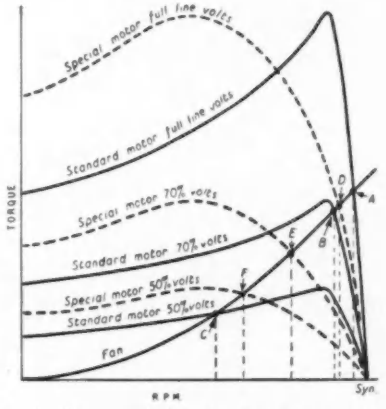


Fig. 8—Characteristics with line voltage control of a squirrel-cage motor

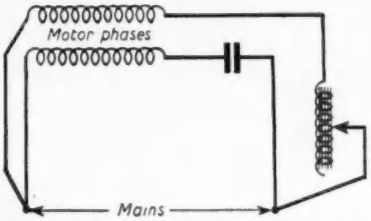


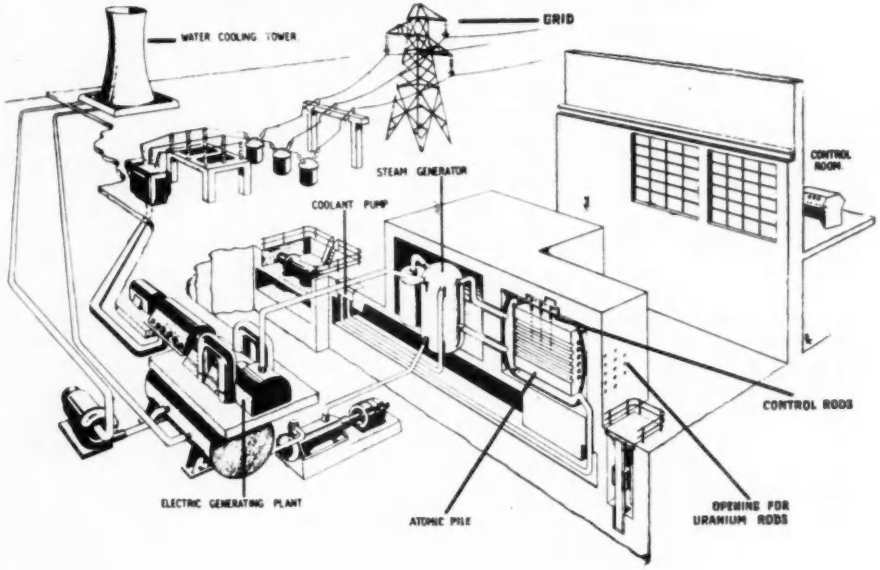
Fig. 9.—Circuit diagram of single-phase capacitor motor with tapped choke

one phase only, while the other winding is permanently connected in series with a starting and running condenser, across full line volts. This system of connections not only ensures good starting torque on regulated speeds, but preserves good power factor.

An interesting modification of this line voltage method of speed control has been adopted for the automatic speed regulation of mercury arc rectifier cooling fans. The squirrel cage (regulating type) fan motor is permanently connected in series with a special (untapped) choke. This choke carries a direct-current winding which is in series with the output of the rectifier. When the rectifier is on full load the d.c. winding saturates the choke, and the cooling fan therefore runs at full speed. As the d.c. load falls, the choke gradually becomes effective, so modulating fan speed and cooling air.

ELECTRIC POWER FROM THE ATOM

Progress toward First Generating Plant



THE accompanying diagram is being shown as part of the Ministry of Supply's display at the Preston Guild Industrial Exhibition, Lancashire, and indicates the cycle which is now being investigated in detail at the Atomic Energy Research Establishment at Harwell. As can be seen, the well-established principle of atomic heat to steam conversion is introduced, the heat being taken from the pile by an intermediate liquid (probably one of the lighter metals in liquid form), and the steam is raised by means of a heat exchanger type of steam generator. The remainder of the plant follows normal conventional practice.

Present estimates indicate that the atomic fuel in such a plant would not need replacement for 15 to 30 years—an indication that the problem of "poisoning" of the fissionable material may be nearing a solution. It is also anticipated that the first experimental pilot unit is to be built in the near future, and considerable research work has been completed.

Our readers' views ...

Fireguard Regulations

IN his Editorial Notes in your issue of August 14, "Meteor" refers to the test procedure to be adopted by local authorities responsible for enforcing the Fireguards Act, and he states that the British Standards Mark will not be generally available since this would certify the overall safety of the fires and the Act is narrower in its requirements.

I would like to point out that there is no inherent difficulty in the B.S.I. mark being available for the purposes of the Act. It is true that the specification for electric fires, B.S.1670, deals with matters other than the guarding of the elements, but it is contemplated that the requirements regarding the guards will be removed from B.S.1670 and embodied in a new specification which will cover also the guarding of gas fires and oil heaters. There would thus be a British Standard Specification dealing specifically with the guarding of fires and the B.S.I. mark could be used, provided, of course, the technical requirements of the regulations to be issued under the Act are in agreement with the requirements of the British Standard Specification.

It is not possible to anticipate the requirements of the regulations, but the object of this letter is to point out that there are no inherent difficulties in applying the B.S.I. mark to fires which comply with the guarding requirements laid down in B.S.1670.

G. Weston

TECHNICAL DIRECTOR,
BRITISH STANDARDS INSTITUTION

◆ ◆ ◆

Static on Cars

I WAS particularly interested to read Mr. Bartlett's letter in your issue of July 17 under the heading of "Static on Cars" in view of my own experience in this direction when on leave in the U.K. last year.

My car was a 1951 model Humber Hawk, and on every occasion that I got out of it I could be sure of receiving a sharp shock on my first contact with an earthed object or even with the door handle or other metal part of the car. It was, in fact, after experiencing a peculiar twinge in my fingers every time I had occasion to close the car door, on getting out of it, that it began to dawn on me what was happening. It is significant, I think, to note that the shock was experienced only when I wore a favourite pair of thick crepe-rubber-soled shoes, and it would appear that, thoroughly insulated in this fashion, I must have been in "fully charged" condition on emerging from my car. Subsequent experiment showed, by carefully approaching a finger to any metal part of the car, that when about 1/16th inch off, a blue-white spark shot across from me to the car with a distinctly audible click accompanied by an appreciable shock extending as far as the wrist. On one or two occasions when I failed to ground myself by prior contact with the car, shaking hands with a friend proved a disconcerting experience for us both.

The experience mentioned above took place in Scotland during the spring and summer months of last year, and I have never encountered a similar one before or since, either at home or out here in India.

T. D. Crabb

CALCUTTA

◆ ◆ ◆

Conferences

YOUR readers who are privileged to attend "electrical" and other conferences, sometimes feel that not enough consideration is given to the selection of dates for the holding of conferences.

The holding of conferences is on the increase, which means that greater demands will be made on a number of popular seaside resorts. It would, therefore, seem advisable that some form of "clearing house" should be established.

Conferences are good, and properly organised provide a link in industry that cannot be forged by any other means. It is suggested that it might be useful if all those responsible for their organisations were to meet, when this, and the many other relevant matters could be discussed. The pooling of experience should be of great value.

If there is sufficient support I would be willing to convene the first meeting.

John W. Simpson

BRITISH ELECTRICAL POWER CONVENTION

U.S.S.R.—*The Latest Five-Year Plan*

AS part of the draft directive for the latest five-year plan—the fifth of the series—extensive augmentation of Russia's electricity system is called for. Within the five year period, it is hoped to double the total capacity of the generating plant and to triple the output of hydro-electric plant. This will involve the completion of the Kuybyshev station, with a capacity of 2,100 MW as well as the Kama, Gorky, Mingechaur Ust-Kamerogorskaya and other stations with a total capacity of 1,916 MW. It also requires the completion and commissioning of the Kuybyshev-Moscow 400 kV transmission system. This new plan relates to the five years 1951-1955.

Power projects to be started involve hydro plants at Stalingrad, Kakhovka, Cheboksary on the Volga, Votinsk on the Kama, Bukhtarina on the Irtysh and several others. In order to exploit local deposits of bauxite and other chemicals, work is to be started to produce cheap electric power on the Angara River.

Industrialisation of the one time Baltic states is to be speeded up by an increase of 2 to 2.5 times the present production of power in Latvia, Lithuania and Estonia. In this connection hydro plants have been scheduled at Narva, Riga and Kaunas. In addition steam power plant and steam raising plant are to be installed in towns and industrial districts for the production both of electric power, process steam and district heating. It is noteworthy that special attention has been paid to automatic control of power station plant.

In order to meet the technical requirements in plant and material of these schemes, a high-speed development of machine building is to be initiated with high priority to ensure the supply of necessary equipment to the electricity stations, iron and steel works, oil refineries and synthetic fuel work.

The size of these projects can be judged from the fact that it has been deduced that should all these schemes be completed the yearly output from the U.S.S.R. electricity generating plant will be in the neighbourhood of 162,500 million units. The British figure at the moment is about 60,000 million units and the American about 432,000 million units. In 1951, a total of about 104,000 million units were generated in the U.S.S.R. according to latest figures—an increase of some 13,000 million on 1950.

Aluminium Sheaths for Wiring Cables

ALTHOUGH the use of seamless aluminium sheathing for power cables is now well established, its application to wiring and control cables may not be so generally realised. A recent publication by Johnson and Phillips Ltd. indicates the characteristics and applications of these cables. They are neat and pleasing in appearance, and in view of the shortage of steel conduit, should prove of particular value at the present time.

Installation Simplified

One of the outstanding features of this type of sheathing is its high strength/weight ratio, rendering it self-supporting in many cases and reducing cleating to a minimum. It can, moreover, be readily adapted to existing structures, a variety of cleating being available for different types of framework. Installation is further simplified by the use of bending equipment, with which smooth bends may be made to any desired radius compatible with the size of sheathing. With such facilities, installation can be carried more quickly and easily than with conduit. Two types of cable end glands for anchoring the sheathing in standard conduit fittings are available.

To these advantages may be added the additional corrosion resistance properties of aluminium, which in most cases allow the cable to be installed without protecting the sheathing from normal atmospheric attack. Under certain conditions, i.e., when the sheathing is likely to be in contact with damp walls or exposed to acid vapours, the makers advise serving the aluminium. The recommended serving process is to bind the sheathing with P.V.C. tape and cover with braid and weatherproof compound. The cable may be embedded with safety in ordinary cement or plaster walls.

Sizes of wiring cables at present manufactured include, for low voltage operation, all normal sizes, including and above 3/·029 twin core and 7/·064 single core. For circuits at 660 V the range provided is in all normal sizes, including and above 1/·044 twin and 7/·052 single-core cables. Control cables are manufactured in a multiplicity of sizes up to a maximum of about 2 in. diameter, and are usually made to customers' requirements.

The Lynmouth Disaster

Restoration of Power Supplies well in hand

LAST week we gave some brief details of the damage done to the generating station at Lynmouth in the disastrous flood which partially demolished the town on the night of Friday, August 15. Further details have now come to hand of the damage done and of the speedy work to restore supplies, carried out by the South Western Electricity Board and the Generating Division.

The Lynmouth plant had an interesting history, being, it is understood, the second hydro-electric plant ever established in the country. It was first started up in April, 1890, when a 150 h.p. turbine was installed, driven by a natural flow of water from the East Lyn River. The water came through 500 yards of leat and 500 yards of 30 in. diameter cast iron pipeline to the turbine. By 1896, the peak demand became a serious problem, and water supply was conserved by the building of a high level reservoir, and the addition of a 50 h.p. Pelton type turbine to carry peak loads. Off-peak surplus power was used to pump water up to the high level reservoir. More efficient turbines were installed in 1904 and 1911, and in 1921, oil engines were introduced to supplement the hydro plant. At the time of the disaster, the station contained two Escher-Wyss water turbines, assisted by two paraffin oil engines, two Ruston and Hornsby oil engines, and one Sulzer oil engine with a total installed capacity of 512 kW (nominal). The station was unique in Great Britain in that it generated at 100 c/s.

The Flood

When the flood struck Lynmouth, the approach road to the lower section of the station disappeared, a portion of the concrete leat supplying water to the hydro-plant crashed into the river and flood-water penetrated the station, cutting off supplies to Lynmouth and to most premises in Lynton (those farthest from the S.W. Board's 50 c/s supply). Mr. C. H. Postles, engineer in charge, disregarding personal danger, kept the station running on the diesel engines following the failure of the hydro-plant. Not until the water level in the station had risen to such a height that the flywheels of the sets were picking up water did he shut down. During this period he worked in total isolation as all communications had failed and he was cut off from the village by the flood water.

Restoring Supplies

As part of the S.W. Electricity Board's development plan, a 33 kV line (operating at 11 kV temporarily) had been erected from Barnstaple to Lynton, and part of the village had already been changed over to the new supply. Upon receiving news of the disaster, emergency measures were taken to connect this line to the existing underground cable system at Lynton, and Electricity Board staff from Barnstaple and other areas were brought in to carry out this work. At the same time, appliances were brought in to substitute for the existing non-standard equipment. Some of the electrical gear required was stored at the

Lynmouth power station stood beside the quietly flowing East Lyn river

flooded station, and the Board and Generating Division staff were for some time engaged in salvage work. More than 120 electricians, linesmen, jointers and labourers were on the scene to complete the task of providing the new supply. As a relief measure, the Board also offered to provide on loan free of charge supplies of heating, cooking and other equipment to reception centres and caravans.

Provision is being made for further extension of the line from Lynton into Lynmouth as the work of road reconstruction and rebuilding proceeds. As much as possible of the old underground cable system will be salvaged. It is thus unlikely that the old power station will again generate its non-standard voltage and frequency.

The Board and the Generating Division would like to acknowledge publicly the devotion to duty displayed by all staff in these recent difficult and often dangerous operations. They would also like to thank manufacturers for their prompt offers of assistance with men and materials.

Laminated Wood Insulators

Use in construction of collector shoe beams on London Transport Underground Railway stock

THE use of laminated wood, bonded with plastic resins, for use in conditions where both electrical and mechanical stresses are encountered has long been known to the electrical industry. A further application of this type of insulant is now announced by the London Transport Executive.

Prior to the war, high-grade, naturally seasoned teak was used for the shoe beams which support and insulate the current collector shoes on London Transport's trains. Shortage of this material during the war led to experiments being carried out with kiln-dried iroko and other timbers. This, however, proved susceptible to splitting, and a suggestion was made that laminated timber bonded together with a weatherproof glue should have good electrical and mechanical properties.

Four experimental beams were consequently manufactured by the Forest Products Research Laboratory, D.S.I.R., using English oak with a cold-setting phenol-formaldehyde resin glue. For purposes of comparison, two beams had the glue lines in a vertical plane and two in a horizontal plane, whilst one beam of each type was of $\frac{1}{2}$ in. and the other of $\frac{3}{4}$ in. laminations; in all cases the grain ran parallel to the neutral axis. Three of these beams have been satisfactory from the date of manufacture (the middle of 1947) up to the present day, but the fourth (of which doubts were expressed at the time of manufacture) was found to have partially delaminated after a seven months' trial period under service conditions.

The laminated structure of the collector shoe beam is clearly visible in this photograph

Further experiments were initiated and have resulted in a fully satisfactory design. The production beams are of plywood board, fabricated from $\frac{1}{10}$ in. birch, ash or mahogany veneers, built up with phenolic resin glue, scarf-jointing being permitted for all except the outermost veneers. The modern technique of radio-frequency heating is used for curing the glue lines, thus completing in ten minutes a process which may take many hours using conventional heating methods.

Drilled holes in the beam are fibre-bushed for insulating purposes and clear phenol-formaldehyde varnish is used as weatherproofing instead of the black bitumen-based insulating varnish which was used for the solid beams.

Although the material used in the laminated beam has considerably less natural durability than that of the solid beam, it is thought that the performance under arduous service of the former will compare very favourably with that of existing solid beams. At the same time, the cost of the manufactured birch laminated beam is only slightly greater than that of its solid iroko counterpart.

Accidents at Night

IS A NEW ASSESSMENT OF RELATIVE BRIGHTNESS NEEDED?

WHEN considering the problems of efficient street lighting, much attention is given to absolute evaluation of light levels and perception, but much less to the effects of contrast and varying lighting intensity on the moving observer. An article in the International Lighting Review, by Dr. Ing. Helmut Lossagk, however, deals entirely with lighting and traffic accidents and analyses the physiological and psychological reactions of the motorist.

He begins by emphasising the chain of operations from stimulus to final operation. This is first a perception of danger, followed by recognition and appraisal of the situation followed finally by the carrying out of the necessary avoiding action.

Light Levels

Man was essentially a "daylight creature" and would continue to remain so; thus the eye possessed its highest relative sensitivity within the range of daylight brightnesses (about 19 to 1900 foot-lamberts). When, therefore, it was necessary to deal with road lighting brightnesses it was essential to consider the effect on the eye of the much lower levels encountered. It was possible to obtain correct "threshold curves" under laboratory conditions, but when it came to applying these to the driver of a vehicle many other factors were involved. The motorist saw everything through a more or less dusty windscreen, his view was restricted, the vibration caused by movement over the ground disturbed concentration of sight, his powers of perception were usually concentrated at a given point other than the danger point, and not as in the laboratory at the given point. Thus in reality the perception threshold could be taken as being about one hundred times the absolute value of the unadulterated physiological threshold curve as obtained in the laboratory. This was largely corroborated by the experience gained in accidents.

There was at present insufficient evidence on the influence of the disturbing factors and none on how far the "striking-value" should be set over and above the "barely perceptible threshold value." This assessment was essential when considering traffic safety.

In point of fact, artificial street and vehicle lighting should make it possible for road-users to appreciate the situation at any given moment, in practice this was far from the case. Compared with daylight, any form of artificial street lighting had the following basic differences. First, the general level of illumination in daylight was about 1,000 times higher than night illumination; second, daylight possessed a high proportion of light in a horizontal plane, whereas most night lighting was vertical; and third, the ratio between highest and lowest brightness in daylight was about 1 : 12 compared with 1 : 12 million when artificial lighting was employed.

Glare

The author continues by discussing the problem of glare, and this section is illustrated with numerous photographs showing how glare can lead to accidents by masking smaller and less intense lights—which might be warning reflectors, traffic direction indicators, and so on—lying just outside the glare area. He also deals with glare distortions such as can be caused by reflection from irregular surfaces, which, he points out, should not be underestimated as causes of accidents. In his view these distortions are far more treacherous, less obvious and more difficult to establish than direct glare.

In conclusion, Dr. Helmut Lossagk reiterates the vital importance of establishing a practical threshold value and makes a plea for more research work into the physiological laws which can lead to non-perception of brightness differences. He states that "we still need indisputable and basic scientific evidence to clear up the still thorny question of 'should the driver have seen the danger, or was it hidden from him?'" An answer to this question which could be scientifically provable would, apart from the judicial aspects involved in cases of accidents at night, also be an excellent criterion in designing lighting systems and road layouts and thus reduce traffic accidents, many of which are due to an involuntary failure in the functioning ability of human senses.

NEW HIGH TEMPERATURE ALLOY

IN order to meet the steadily increasing demands of gas turbine engineers for materials which will withstand still higher temperatures and higher stresses than the alloys used in current production engines, the research metallurgists of the Mond Nickel Company, Limited, have continued their investigations in the field of precipitation hardening nickel-chromium alloys. The latest outcome of these investigations is the alloy Nimonic 95. This alloy is similar to Nimonic 90 but the creep-resistance at elevated temperatures has been improved.

All alloys which have high creep-resistance at high temperatures are necessarily difficult to hot-work and one of the major problems in the development of a new alloy is to maintain sufficient forgeability to enable the material to be worked to the required form. Any increase in the maximum temperature at which an alloy is serviceable necessarily involves a reduction in the temperature interval within which hot-working must be carried out, for the increase in the amount of alloying elements does not usually produce at the same time an increase in the melting point of the alloy. Nevertheless by careful control of the proportions of the hardening elements and of the methods of melting and casting of ingots, as well as by improvements in the technique of hot-working, it has been found possible with Nimonic 95 to maintain adequate forgeability.

Since Nimonic 95 has only been developed within the last few months it has not yet been possible to determine its creep properties in long-term tests or over a wide range of temperatures, but its properties for the relatively short periods which are of major interest for aircraft jet engines show a considerable improvement over those for Nimonic 90.

Tests are in hand to extend the knowledge of the creep resistance of the new alloy and to determine other properties of importance to designers, but in the meantime it is being produced by Henry Wiggin and Company, Ltd., and is being used in experimental quantities by engine builders.

Electricity Prices Rise in Belfast

AS was anticipated in the Annual Report of the City and County of Belfast Electricity Undertaking for 1951, a price increase in the cost of electricity has now been imposed to meet the increase in capital charges. This increase has been imposed generally on all forms of tariff. Domestic consumers will pay an increase of 10% on the fixed part of the tariff, but the price per unit will remain unchanged. Other users will pay increases ranging from 4·1% to 10% depending on their category and the type of tariff. The overall percentage increase is 6·67%.

In the Annual Report for the year ending March 31, 1952, it is shown that the annual growth of load has fallen from 12·48% in 1951/50 to 5·66% in 1952/51. This decrease, taken in conjunction with the increase in capital costs and fuel prices has made it impossible to continue at the original rates. It is anticipated that the additional revenue, derived from the higher charges, should result in a credit balance in the region of £43,000 on the trading of the current year.

The Report shows an increase in revenue of £245,906 over the previous year, but total costs, including loan charges, increased by £250,328. Although a gross profit of £381,860 was made, after meeting full outgoings and allocations, a balance of £52,859 remained for the appropriation account.

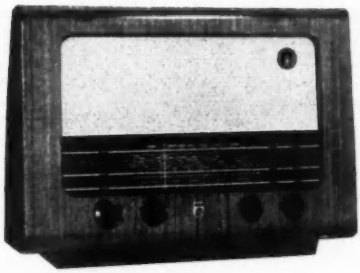
Technical Works

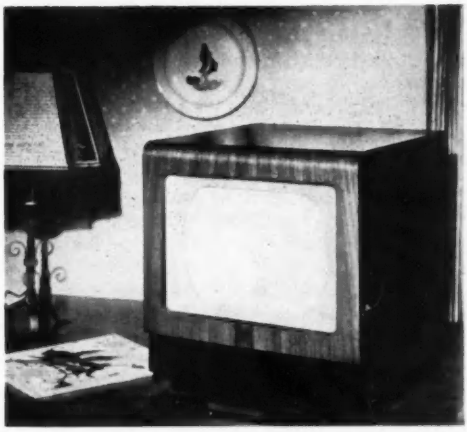
No major technical works were recorded as having been completed during the year, although substantial reinforcement of the distribution system, including cabling and substations was carried out. Harbour Power Station h.p. plant generated some 51% of the units sold. Extensions at this station are in hand and it is hoped that the 30 MW generator and one boiler should be in commission at the end of November. A second boiler which will enable the set to take up full load, is scheduled for operation by the end of November, and the third boiler should be complete by 1954.

The picture of the situation at Victoria Power Station is, however, not so clear. The original commissioning date of September 1953 was postponed to February 1954, due to steel shortages. Discussions with various interested parties and difficulties of assessment of civil engineering work against specification have shifted this date to May 1954. Now the necessity for obtaining revised loan sanction makes it probable that the commissioning date may have to be further revised to August 1954. Preliminary work has, however, begun.

The 19th Radio Show

AT EARLS COURT, LONDON FROM AUG. 27 — SEPT. 6





Above is Ferranti's Model T 1325 AC/DC Table Television Set, and on the left is the Philips 5-valve table superhet, a new model shown for the first time this year

MANUFACTURERS of domestic radio sets and television receivers are this year facing a critical position. Purchase tax, the restriction of hire purchase agreements, and a shortage of ready money on the part of the general public have combined to reduce sales in the past few months to a remarkably low level. Confidence has, however, been expressed that this fall in sales is a temporary phase and that trade will pick up again in the near future. That this confidence is well founded has yet to be proved, but the darkening clouds of trade recession are not reflected in the wealth of exhibits and demonstrations prepared for this year's Radio Show.

Venue of the exhibition is Earls Court, London, where the Show has opened its doors to the trade and public from Wednesday, August 27, to Saturday, September 6, with the exception of Sunday, August 31. The price of admission is 2s. 6d. for adults and 1s. for children, and special party terms are available.

Special Attractions

Although as usual the show is mainly devoted to exhibitions of domestic and commercial television and radio sets, together with radiograms, components and accessories, there is, this year, a collection of specialised demonstrations of electronic equipment. First exhibit to be seen by the visitor is an electronic guide to the day's programmes. By pressing one of a number of buttons marked "Studio," "Celebrity dais," "Underwater television," or "Radio-controlled boats," an automatic announcer will give in different languages through a loud-speaker details of arrangements for the day including times of demonstration. This equipment, supplied by the Westinghouse Brake and Signal Co., is actually designed for use at railway stations for announcing the arrival or destinations of trains and has been modified to carry out its new duties.

Considerable interest has been shown in underwater television since the location of the submarine *Affray* by this means, and the public will have an opportunity of seeing the equipment operating in conditions approaching those encountered on the sea bed. By means of glass panels in the side of a tank containing water, they will be able to see the actual objects being viewed by the underwater cameras and compare the reality with the TV pictures as shown on a screen alongside. This exhibit is the responsibility of Marconi's Wireless Telegraph Co., who are working in conjunction with Siebe Gorman and Co.

More familiar to the metallurgist, but not so frequently seen by the public, is Redifon's demonstration of radio-frequency heating equipment. In this case, the hardening of steel is being demonstrated. A 7 kW unit is used to heat a steel billet of one-inch section to red heat in a few seconds. At the end of the heating cycle, water is sprayed over the heated

metal. The demonstration aims at showing how great heat can be applied to a highly concentrated and, if necessary, selective area by means of r.f. heating.

Belling and Lee are demonstrating a mobile television research laboratory complete with power supply from large batteries and with a special 40 ft high aerial mast. This mast is designed for easy erection and dismantling. The vehicle is normally used for research and development work on television aerials, for the measuring of field strength and for solving reception problems of all kinds. It travels round the country measuring aerial properties and plotting polar diagrams thus enabling advice to be given on the correct type of aerial to be used in a particular location. Instruments for detecting, locating and measuring interference are important items in this mobile laboratory's equipment.

Remote Control

Remote control equipment in operation always attracts an interested audience, and Philips Electrical in their exhibit amply cater for such people. Half-hourly demonstrations, with running commentaries are to be given during the run of the Show, of two model ships controlled by radio from an enclosed cabin at one end of a tank 40 ft long by 25 ft wide. The smaller of these two ships is 4 ft long and is manoeuvred by two controls operating the propeller and rudder, while the larger is 6 ft long and has nine controls altogether. On the main propulsion side, both the port and the starboard propellers can be controlled independently, and a further control can be applied to the rudder. The lifeboats can be raised and lowered, and the highlight of this demonstration is reached when a model seaplane is catapulted from the ship's deck into the tank, and is then hoisted back on to the launching ramp by crane.

Television pirates will be interested in the G.P.O.'s mobile "sleuth"—a van which can pick up the oscillating magnetic induction field set up by the line-scanning coils in a television receiver when it is operating. By means of loop aerials and an audio output meter, the position of the set can be pin-pointed and verification made to see if the householder possesses a licence. A small portable locator can also be used to track down receivers in large buildings such as flats.

Various official bodies are also supporting the Show. The College of Aeronautics, for example, is demonstrating electronic equipment used for testing the vibration characteristics of aircraft. It is unfortunate that the Imperial College is unable to demonstrate the cavity resonator for dielectric measurement as was originally promised, but there is a display of photographs of this equipment.

Training in the R.A.F. is demonstrated by some apprentices from Cranwell who are showing typical phases of their training during their three-year course of instruction. These lads can be seen constructing a three-valve superhet a.c./d.c. receiving set, carrying out such operations as coil-winding, drilling chassis, soldering, final assembly and testing.

Hall of Television

As in previous shows, there is a special section devoted exclusively to the demonstration of television receivers. This year, however, a somewhat different design has been adopted, and the "Hall of Television" is at the Warwick Road end of the first floor instead of at the west end. The booths are placed on both sides of a long rectangular hall with a central longitudinal partition. There are 34 booths in all, and the number of receivers in operation is about 80.

Lord Burghley, President of the Radio Industry Council, opened the Radio Show at midday yesterday. On September 2, B.R.E.M.A. is organising a Dealers' Convention in which several speakers will take part.

The Exhibition proper contains, as usual, a bewildering number of models of radio and television sets and in addition there are numerous examples of specialised production and routine testing equipment. Television, as is to be expected, holds pride of place with a tendency towards ever larger tubes. Projection TV pictures have been improved with the introduction of new screen materials, and there is also further development in wall projection sets for special purposes. On the whole, however, no revolutionary changes are being shown in this field.

Radio Sets

The progress in radio set design has also, for the time being, come to a comparative standstill. Here, the main trends lie in improved styling, and concentration has been focused more on the sound side than in the h.f. chassis. Thus the use of 8 in. diameter high-efficiency speakers and in some cases 10 in. units is becoming popular in radiograms.

Still more of the small attractive battery and transportable radio sets, and the mains/battery portables are on display.

Further details of new products will be given in our issue next week.

Problems and Practice

IN ENGINEERING

Moving-Iron Meters

SOME time ago I noticed an attendant changing over from one d.c. generator to another. The change was made by the somewhat nice, but unusual, method of tripping the circuit-breaker of the first machine and then immediately closing in the other. I learnt that this practice had been adopted because previously there had been serious troubles when paralleling. The voltmeter used to check the voltage was of the moving-iron type and was therefore not polarity sensitive. As, on occasion, the machine had been known to generate in the reverse direction, paralleling had become a perilous operation. One might draw the moral—don't use moving-iron meters for this work.—*H. G.*

Lamp Testing Reprieved

YOUR correspondent in his contribution entitled "Imperfections of Lamp Testing" August 21, 1952, appears to view with disfavour the use of a 60-watt lamp for test purposes. With all testing for fault location, first apply those tests for suspected faults which have previously been encountered, followed by tests for the less likely faults.

Having tested quite correctly so far, the test for phase to phase volts should logically have followed, for there are more cases in practice of more than one phase being at the same potential than he has perhaps encountered. I suggest that the "two lamps in series" test between line volts is preferable to voltmeter testing for the maintenance man for the following reason. Due to the high resistance of the voltmeter, the test current is very small and somewhere in circuit may be a current limiting fault, preventing enough current from passing to the motor, but sufficient to give full volts on the meter. Two 60-watt lamps in series are more likely to confirm the presence of a supply of correct voltage and of sufficient current.

An occasion comes to mind where a three-phase motor in a bakehouse ran perfectly at the end of one shift but refused to start at the commencement of the next. Tests were made including volts test with two neon lamps, and the circuit appeared in order. Just as the motor was about to be removed, it was found that the line conductors feeding the isolator had been almost severed by a weight that had dropped on to them from some height. The current was sufficient to give full glow with the neon lamps, but insufficient to enable the motor to operate. Two 100-watt lamps in series confirmed a current limiting fault. I trust these remarks will prompt your correspondent to reprieve his 60-watt test lamp.—*R. W. Marsh.*

Resistance in Neutral Wire

CONSIDERABLE trouble was experienced some time ago with a 200 V two-phase squirrel cage motor which was supplied through a three-pole switch. The supply for this switch was taken through a long run of three-core cable, connected at the supply end to a second three-pole switch. On closing the motor switch, the motor merely hummed to itself and refused to start, although on no load.

On testing, the motor gave satisfactory results for both insulation and continuity, and further checks with a voltmeter established that the correct voltage between lines and to earth was established across the windings. After having dismantled the motor and found nothing out of order, it was decided to return it to repair shop where the motor, on being connected to the local supply, started up without bother.

Consequently, further attention was again paid to the supply circuit, and on close inspection the fault was located in the supply switch. The blade in the neutral was found to be open, and, moreover, the insulation of this blade, having failed, presented a resistance of about 50 ohms to earth. Hence the neutral wire from the supply to the motor was made in series with this 50 ohm resistor, causing the two phases to be almost in phase instead of being separated by 90°, and this "single phase" effect prevented the motor starting.—*P. B.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Problems of a practical nature to which a solution is required will also be considered. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

ESCOM in 1951

Generating plant on order will nearly double present capacity

SOUTH Africa's demand for electricity is still exceeding the supply capacity, in spite of intensive efforts to increase output by the erection of new power stations. Rapid expansion of the country's mines and industries is stated to be the cause of the increasing demand. In the calendar year 1951, 7,456·5 million units was the total of energy sold, an increase of 7·9% on the 1950 figure.

This information is given in the 29th report of the Electricity Supply Commission of South Africa, which reviews activities up to April 30, 1952. During this period, senior officials of the country travelled abroad in an effort to speed up deliveries, and some success was obtained in this aim. As a result of their experience, orders were placed in various European countries, and priority for supplies of material was secured in several cases where the mining of radioactive ores was involved.

Plant commissioned during 1951 included a 40 MW turbo-alternator at Congella and a 33 MW unit at Vaal. Under erection at the end of the year were boilers at Congella, Umgeni, Vierfontein, Hex River, Vaal, and Witbank, with turbo-alternators at the last three of these. Altogether, 59 boilers ranging in size from 75 to 580 klb/hr were on order or under erection at the year's end, and 36 turbo-alternators, totalling 1,103 MW. Since then, four 400 klb/hr boilers and one 60 MW set have been ordered for the new Wilge station. This last is to be constructed near Kendal, in the Transvaal, and is planned for an ultimate capacity of 180 MW, with the total cost £10·3 million. It is hoped to have the station completed by the end of 1955.

Station Progress

Hex River station, at Worcester, commissioned its first boiler and turbo-alternator in June last. It is planned to have five 20 MW sets, part of the output of which will be used for railway electrification. Salt River No. 2 is being constructed on a site adjoining the existing station of that name, and one 30 MW turbo-generator is expected to be in operation by the middle of 1954.

Further east, at Port Elizabeth, progress is being made with civil engineering work for the Swartkops station. The first set here is planned for operation in the latter part of 1953. Three 20 MW sets are to be installed, and after that, 30's. In the Orange Free State, at Coalbrook, it is hoped to begin construction of the Taaibos station in October. Shortage of steel has delayed progress, but operation in the second half of 1954 is hoped for. Vierfontein is another station in the O.F.S. on which progress is reported, the erection of turbine house steelwork for the first three sets being completed during the year, and a start made on the boilers. Commissioning of the first set is scheduled for 1953.

At about the same time, the first 30 MW generator at the Umgeni station which is to supply Durban, should be coming into operation. The ultimate capacity is to be eight 30 MW turbo-alternators. Finally in this list of new stations comes West Bank No. 2, at East London. Erection of steel work is expected to start shortly, and a 1954 operating date is scheduled.

Finance

Operations during 1951 resulted in a loss of £146,919. This followed from the 16% increase in production costs, which was matched by a revenue increase of only 15%. Prominent in the cost increases was coal, with a 23·6% increase for only 5·4% greater quantity. At the end of the year, certain tariff adjustments were pending. Undertakings which recorded a deficit on the year's working were Cape Western, Border (East London, King Williamstown and Alice) and Rand (the largest—£111,705.).

Summing up, at the end of 1951, the Commission controlled eight undertakings, and operated through them, 20 power stations. In these were installed 223 boilers, with an aggregate evaporative capacity of 10,935 klb/hr, and 97 main generators, which together with eight house sets have a capacity of 1521 MW. On order were a further 59 boilers, 13,870 klb/hr c.m.r., and 36 generators, totalling 1,103 MW.

Starter Switch or Quickstart?

asks W. A. STICKLEY (Ecko-Ensign Ltd.)

BOTH HAVE THEIR PART TO PLAY IN FLUORESCENT LAMP INSTALLATIONS

WHEN a user of ordinary tungsten lamps finds that his lamp does not light, the remedy is usually simple—he replaces it. In this case he has only one expendable item in his lighting installation, which is the lamp. With fluorescent lighting the circumstances are different. This time he could have two expendable items—a lamp and a starter switch. In the first case, almost anybody—housewife, shop porter or workshop labourer—could deal with the problem. In the second case an electrician or other skilled person may be required to first determine which component is at fault, and then to carry out the necessary work.

It is true that troubles other than the replacement of expendable parts can arise, but in any case it will then be necessary to employ an electrician to deal with the fault. Therefore, if fluorescent lighting is to be used universally, maintenance must be simple and preferably limited to the periodic replacement of one expendable item only—the lamp. This is true even for large installations, for if bulk relamping is carried out at, say, 4/5,000-hour periods, and starter switches are used, the problem of switch replacement also arises.

Fortunately, fluorescent lamp starting is not limited to the starter-switch method. In a suitably designed installation Quickstart units can be used, and because they are static transformers their life is practically infinite and they are not expendable. The introduction of the Quickstart brought fluorescent lighting into line with tungsten installations in this respect by reducing the expendable components to one.

It would seem from the foregoing that it would be better to use Quickstarts always and allow the use of starter switches to lapse. Unfortunately, the first cost of a Quickstart is considerably higher than that of a starter switch. Further, Quickstarts require special conditions for good operation and the extra power expended in heating the lamp electrodes reduces the circuit efficiency. It is essential, therefore, to consider both techniques before specifying either. In order that useful rules can be applied to the problem, it will be necessary to appreciate the differences in the techniques employed in the two systems.

Starter Switch

Two main types of starter switches are normally used: the glow starter switch (Fig. 1) and the thermal type (Fig. 2). There is variety in the design of each type of switch to suit the variety of lamps and mains voltage conditions. Some will work on a.c. only and others on a.c. or d.c. A chart (Table 1) shows a range of starter switches manufactured by one firm. Although the method of heating the bi-metallic elements of the switch may differ, the lamp starting cycle is practically the same, for in both cases the switch provides a bridge for current to pass through the electrodes before the lamp lights, followed by a high-voltage pulse generated by the collapse current of the choke when the starter switch contacts open. Thermal switches are not recommended except for use on d.c. They have four terminals and are more expensive than a glow switch.

Discharge lamp circuits are not always of the simple choke type. This is due to a variety of reasons, some economic, others to accommodate the variety of supply voltages and, of

course, lamps. In the circuit shown in Fig. 3, starter switches are recommended to avoid troublesome resonance conditions which would arise if a Quickstart were used in the capacitive part of the circuit.

TABLE 1. TYPICAL RANGE OF STARTER SWITCHES

Type	Lamp Size	Base	Dimensions	
			Length in.	Diam. in.
Thermal	80 W 5 ft on d.c. 40 W 2 ft on d.c. and a.c. ...	4-pin	2¼	1⅛
Glow	80 W 5 ft on 200/250 V a.c....	4-pin	2¼	1⅛
Thermal	40 W 4 ft on d.c.	4-pin	2¼	1⅛
Glow	40 W 4 ft and 30 W 3 ft on 200/250 V a.c.	4-pin	2¼	1⅛
Glow	40 W 4 ft and 30 W 3 ft on 200/250 V a.c.	2-pin	1 $\frac{9}{16}$	$\frac{13}{16}$
Glow	20 W 2 ft and 15 W 1½ ft on 100/250 V a.c.	2-pin	1 $\frac{9}{16}$	$\frac{13}{16}$
Double Glow	Series pairs—40 W 2 ft, 20 W 2 ft, 15 W 1½ ft on 200/250 V a.c. (one switch per pair of lamps)	4-pin	2¼	1⅛
Glow	80 W 5 ft, 40 W 4 ft, and 30 W 3 ft. on 200/260 V a.c.	4-pin	2¼	1⅛

Quickstart

A range of Quickstart units is now produced which will start any of the standard lamps, and a typical circuit is shown in Fig. 4. In addition to the different method of heating the cathodes, the principle of Quickstarting differs materially from the switch method, for the Quickstart relies on a potential gradient existing between the inner and outer walls of the lamp when mains voltage potential is applied between the electrodes. This potential gradient can exist, to a useful degree, only when assisted by a conducting path placed very close to the lamp. Ionisation results along the inner lamp wall (*d*) near the conducting path (*c*), and the arc then forms when the electrodes reach emitting temperature. It should be noted that no high-voltage pulse is required to start the lamp in this case.

In cases where the lamp is supported in an earthed metal fitting within ¼ in. of the spine or reflector throughout its length, satisfactory starting is obtained over the full range of normal supply voltages 200-250 V a.c. and gives ample provision for fluctuations in supply potential.

In cases where the supply voltage does not fall below 230 V greater liberties can be taken with the design and the earth distance can be increased to ¾ in.

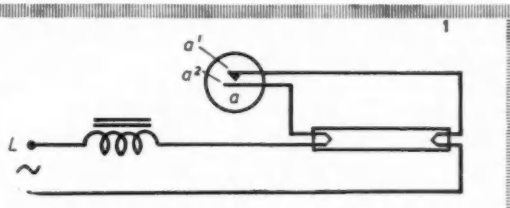
In situations where no metal fitting is used, it is necessary to use lamps having a metal strip, sometimes made of nickel, approximately $\frac{1}{16}$ in. wide, attached to the lamp with an adhesive and to the metal lamp caps by welding or other means. It is essential that this metal strip is earthed in order to improve starting and also desirable for safety reasons.

Some difficulty arises with Quickstart operation in damp situations. In this case a film of moisture can cover the whole lamp and provide a comparatively low resistance path along the outer wall of the lamp, the ionising potential gradient is much reduced and the lamp fails to light. A neat solution, applicable to large-scale production, which has been adopted by some manufacturers, is to coat the lamp with a water-repellent transparent material. Another solution is provided by the metal strip referred to above, but this is ineffective if it does not touch the surface of the glass along the whole length.

The possible ambient temperature in which the lighting installation may be called upon to operate should also be studied, for starting is more difficult in cold situations, due to increased thermal losses, which result in lower mercury-vapour pressure and the subsequent greater voltage required to cause the development of the arc. Circuit conditions limit the amount of power that can be used for filament heating. Fig. 5 shows the voltage conditions obtaining in the "pre-strike" period. In this case assuming that each electrode passes 1 ampere, the primary winding will have an impedance value of approximately 2,000 ohms if the Quickstart losses are included. If the filament volts and amps were raised the impedance of the Quickstart primary, which is effectively in shunt with the lamp, would decrease in ratio and the lamp would not light.

TABLE 2. TYPICAL RANGE OF QUICKSTART UNITS

Lamp Size	Dimensions				Weight
	Length in.	Width in.	Height in.	Fixing Centres in.	lb
Single 80W 5 ft (brick type gear)... ...	4	3 $\frac{1}{16}$	2¼	3½	2·2
Single 80W 5 ft (slim type gear)... ...	8⅜	2¼	1½	8¼	3·3
Single 40W 4 ft or 30 W 3 ft	6	2¼	1½	5¾	1·7
Series pair 40 W 2 ft	6¼	3 $\frac{1}{16}$	2¼	6	3·4
Twin 80 W 5 ft (brick type gear)... ...	6¼	3 $\frac{1}{16}$	2¼	6	3·4
Twin 80 W 5 ft (slim type gear)... ...	9⅜	2¼	1½	9	3·5
Twin 40 W 4 ft or 30 W 3 ft... ...	6¼	2¼	1½	6	1·8



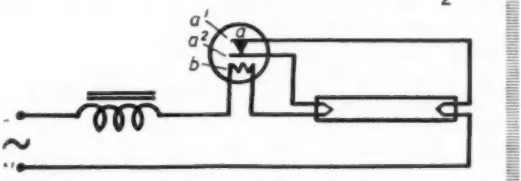
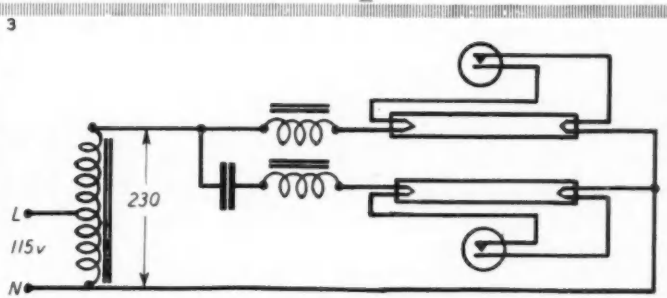
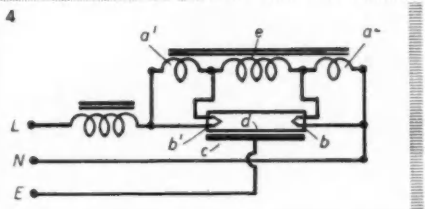


Fig. 1, top, shows a glow starter switch (a). A glow discharge between metal strips a^1 and a^2 causes bi-metal strip a^1 to heat up and bend towards a^2 until contact is made. In the thermal starter switch, Fig. 2, below it, the element b provides the heat. In Fig. 3, below, a twin lamp circuit is shown, supplied from 115V mains

Fig. 4, below, shows Quickstart connections. Windings a^1 and a^2 provide heating current for electrodes b^1 and b^2. Fig. 5, to the right, shows the voltage conditions obtaining in the pre-strike period





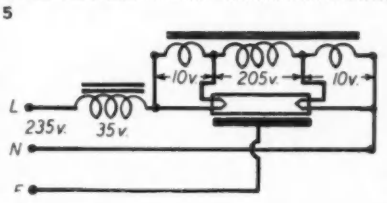
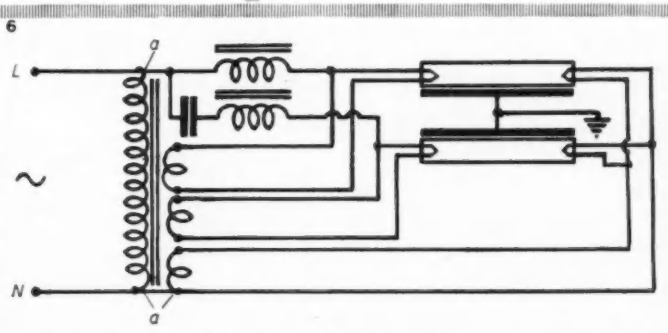


Fig. 6, right, shows one method of applying Quickstarts to twin lamp circuits



For twin-lamp circuits a special type of Quickstart is available (Fig. 6). Ordinary Quickstarts cannot be connected directly across the lamp, for no two discharge lamps will have exactly the same starting characteristic, and one will always start more easily than another, and the first lamp to light causes a voltage drop in the Quickstart, and the second lamp, always the worst in this respect, cannot start. In Fig. 6 the current supplied by windings marked *a* to the electrodes will be practically the same in the pre-strike period as in the lamp-operating condition. This value must be chosen with great care or early lamp failure or bad starting will result. It should be noted that the Quickstart primary impedance cannot affect the lamp starting or running in this case.

This difficulty is overcome by using direct on mains Quickstart transformers with separate heater windings.

Quickstarts are available for voltages from 200 to 250 and for frequencies from 33⅓ to 100 cycles. Low voltages would require an auto-transformer to increase the input voltages, particularly for the larger lamps (4 and 5 ft).

A chart (Table 2) gives details of a range of Quickstarts produced by one manufacturer.

Quickstart Applications

Quickstarts should be used when the following applies:

(*a*) Where immediate and extremely reliable starting is essential.
(*b*) Where servicing of the installation is difficult and where skilled maintenance staff may not always be available.
(*c*) In reasonably temperate conditions (5°-35° C).
(*d*) In fittings with metal reflectors or spines which are not more than ¼ in. lateral distance from the lamp and good earthing is available for supply voltages down to 200 V. For voltages of 230 and above the distance may be increased to ¾ in.
(*e*) Where frequent switching is to be expected.

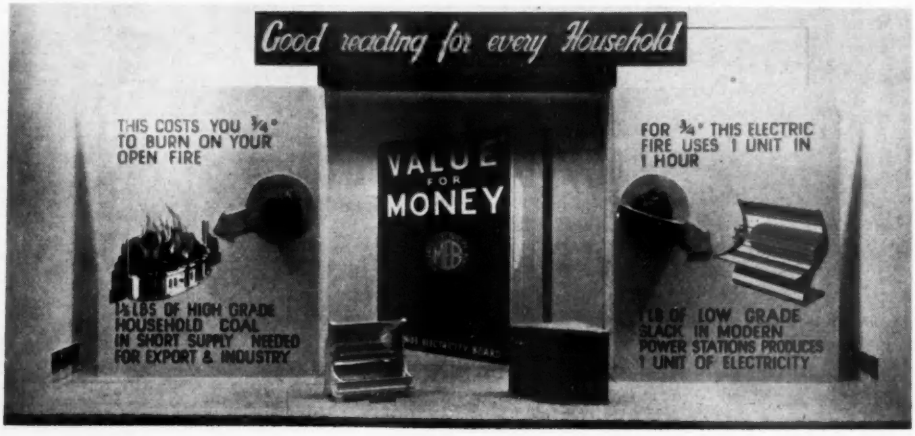
Starter Switch Applications

The switch method of starting low-pressure fluorescent lamps should be used when the following applies:

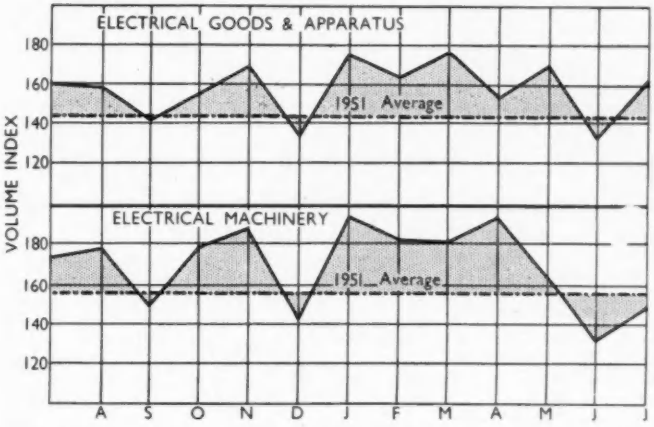
(*a*) Where low first cost is of paramount importance.
(*b*) Where extra high-efficiency (power input to light output) is required.
(*c*) Where starter switches are easily accessible for replacement.
(*d*) In extremely damp and/or cold situations.
(*e*) For direct-current working.
(*f*) Where non-metallic fittings are used and a metal strip lamp is impractical or not available.
(*g*) In atmospheres where a detergent may be deposited on the lamp.

TELLING THE PUBLIC

All service centres of the Midlands Electricity Board are now featuring this striking window display, which presents to the general public the fuel economy possible in amount and quality of fuel which results from the use of electrical methods of heating. It is interesting to note that the display has attracted no adverse comments from the general public


Good reading for every Household
THIS COSTS YOU ¾d TO BURN ON YOUR OPEN FIRE
1½ LBS OF HIGH GRADE HOUSEHOLD COAL IN SHORT SUPPLY NEEDED FOR EXPORT & INDUSTRY
VALUE FOR MONEY
FOR ¾d THIS ELECTRIC FIRE USES 1 UNIT IN 1 HOUR
1 LB OF LOW GRADE SLACK IN MODERN POWER STATIONS PRODUCES 1 UNIT OF ELECTRICITY

EXPORTS AND IMPORTS



EXPORTS VOLUME INDEX

Exports of electrical equipment recovered somewhat during July from the low June levels. This was especially noticeable in the case of electrical goods and appliances, for which the "Electrical Times" export index increased from 130—the lowest this year—to 161 based on the average monthly volume during 1947. The total value of exports in this class was £9,817,491.

For electrical machinery exports the index, although showing a marked improvement, remained comparatively low compared with recent performances, at 148% of 1947 levels. The actual value of the machinery exported was £4,405,938.

THE decline in the value of electrical goods exported has been arrested by the return to almost normal of the figures for the month of July. But last month's total of £14,746,089 is still £1,326,922 below the record figure so far achieved—that for the month of March last. It will be noted that the value of electric cooking and heating apparatus sent abroad last month was a little higher than for June (which had fewer working days) but the total is well below the £511,937 recorded for May.

In addition to our table below, complete electric washing machines valued at £317,633 were exported in July (compared with £412,597 in June and £471,878 in May), together with 1,682 portable electric tools amounting to £128,330.

Description	Exports Value Month of July			Imports Value Month of July		
	1950 £	1951 £	1952 £	1950 £	1951 £	1952 £
Telegraph and Telephone Wires and Cables—						
Submarine	425,475	62,882	55,950	—	—	—
Other	658,316	615,257	657,728	—	—	—
Rubber Insulated	332,415	524,237	685,523	—	—	—
Insulated, other than Rubber	618,705	919,250	1,502,594	—	—	—
Wireless Apparatus, including Valves	1,487,446	2,422,167	2,303,559	201,292	307,557	366,766
Telephone and Telegraph Apparatus	1,489,515	1,560,280	1,621,073	—	—	—
Electric Lighting Appliances, Accessories, Fittings and Parts:—						
Filament Lamp Bulbs	106,039	136,037	102,830	23,704	17,329	8,056
Other Descriptions	313,557	365,176	562,032	31,146	63,595	26,147
Batteries (primary)	192,495	278,695	219,696	—	—	—
Accumulators, Portable	233,251	358,255	199,455	—	—	—
,, Stationary	18,630	66,558	127,135	—	—	—
,, Parts and Accessories	75,616	63,626	73,823	—	—	—
Electrical Cooking and Heating Appliances	258,036	503,881	306,497	—	—	—
Ammeters, Voltmeters, etc., and Parts	106,000	118,949	162,028			
House Service Meters	76,302	101,246	129,582	30,978	39,990	88,372
All Other Instruments	122,740	153,399	160,827			
Electro-Medical Apparatus	44,275	50,237	37,757	—	—	—
X-Ray Apparatus, etc.	100,266	151,302	140,248	29,554	59,078	22,062
Insulating Materials	161,110	211,530	140,793	—	—	—
All Other Articles	445,212	630,874	628,361	80,034	135,362	204,374
TOTAL OF GROUP	7,265,401	8,893,738	9,817,491	396,708	622,911	715,777
Electrical Machinery:—						
Generating Sets (Diesel)* Not exceeding 200 kW	453,966	479,853	408,955			
,, ,, Exceeding 200 kW	90,135	189,121	127,106	28,987	15,862	29,021
Other Generating Sets	364,858	128,580	316,450			
Generators minus Prime Movers, and Parts†	308,350	474,302	518,013			
Motors	636,533	835,840	810,629	18,336	38,820	35,119
Converters, Transformers, Rectifiers, Motor Control Gear, Switchgear, other machinery	1,734,366	2,230,175	2,224,785	14,876	39,789	23,247
Fans, Electrically and Power Driven	92,247	179,436	209,063	—	—	—
Vacuum Cleaners or Electrically Operated Appliances	327,288	563,693	313,597	—	—	—
TOTAL APPLIANCES AND MACHINERY	11,273,144	13,974,738	14,746,089	458,907	717,382	803,164

* 1950 Figures include generators minus prime movers. † 1950 Figures for parts of generators only.

overseas news

British Engineers Visit N.S.W.

Perturbed at the possibility that the New South Wales Electricity Commission might obtain dollars from the Federal Government to buy new generating plant from the U.S.A., a deputation of five from the British electrical industry paid a rush visit to Australia earlier this month to try to persuade the Commission to purchase British power plant. The deputation consisted of H. Ewbank (Ewbank and Partners), J. Caldwell and H. M. Matthews (English Electric Co., Ltd.), and A. Law and R. E. Zoller (Babcock and Wilcox, Ltd.). The arrival of the deputation followed negotiations between the Prime Minister, Mr. Menzies, and the State Premier, Mr. Cahill; the latter asked for $20 million dollars to buy U.S. plant. The reason for the hurried visit was because a U.S. concern offered to deliver within 2½ years two 70,000 kW steam turbo-alternators which could be used at either Balmain or Bunnerong power stations, according to reports. The units would operate at 1,450 lb/sq. in., 1,000° F, with 1,000° F reheat. Members of the deputation arrived back in this country last weekend, and further developments are awaited. It is reported that in the earlier meeting between Mr. Menzies and Mr. Cahill, the former declared that suitable plant could be obtained in Britain; but Mr. Cahill maintained that the U.S. was the only source from which plant could be obtained promptly. He stated that plant capable of making a valuable contribution towards ending blackouts in N.S.W. was now on the production line in the United States.

Relieving a Shortage

Two former naval tugs which have been anchored at Iron Cove for more than 18 months, feeding about 4,000 kW into the supply system at Balmain, Sydney, New South Wales, have been sent to Port Kembla to help relieve the acute power shortage in southern and south-western N.S.W. In addition, the State Electricity Commission is transferring to Canberra four diesel sets ordered from England for a power house started at Waterloo (on which work has stopped, as we noted last week). The Electricity Commissioner, Mr. H. G. Conde, has stated that the grave shortage of generating capacity in the southern area has been causing considerable concern. Although the power supply position generally has improved recently due to the commissioning of the new 50,000 kW generator at Pyrmont, transmission line limitations have prevented the extra power from reaching the south. The 9,000 kW generated by the Canberra station and the tugs would increase the output of the southern part of the State by about 12%, he added.

Expansion Planned

Dalby Town Council, Queensland, has decided to borrow £461,733 for works and services. Of this £295,583 is for additional power plant, transmission lines, extensions to the power house, and rural electrification schemes.

First Unit on Load

The first of five 54,000 h.p. generating units at the Peribonka No. 1 power plant of the Aluminium Co. of Canada, was put into operation a few days ago. The remaining sets will be put into commission within the next three months, and on completion there will be an official opening of the station.

Quebec Project

Further details are now available of the Bersimis River power project of the Quebec Hydro Electric Commission, to which we referred on August 7. Premier Duplessis has announced that the Commission is to go ahead immediately with this scheme. The plant, which will have an initial capacity of 500,000 h.p., is to be located on the 260-mile-long Bersimis River, and will cost approximately $100 million. Completion is scheduled for the end of 1956. A 200 ft high concrete dam is to be built at the point where Lac Casse discharges into the river, about 400 miles from Montreal, forming a lake of some 400 billion cu. ft of water. A 7½ mile tunnel will carry water to the power plant which will operate under a head of about 870 ft. Although initially of 500,000 h.p., the power house will be designed for an ultimate capacity of 1,000,000 h.p. A portion of the power from this new development will serve the Gaspe Peninsula, where Noranda Mines is planning to develop its huge copper deposits. Four submarine cables will be laid under the St. Lawrence, a distance of about 3½ miles, and, at the deepest point, 1,200 ft below the surface.

Italy's Problem

Drawing attention to the fact that Italian hydro-electric power resources were being rapidly exhausted, Signor Ferrerio, chairman of the Edison Electric Co. of Italy, recently told the American Society of Mechanical Engineers that the country's power industry, which was almost entirely hydro-electric, had reached a stage where it could no longer rely upon water as its main source of energy. In view of the increasing power demand the supply industry had to base its future development on a fuel for steam power stations, but the main problem was to what extent steam power could be supplied for the

additional requirements of the country. This raised delicate problems, he added, for Italy was notoriously lacking in both coal and oil, and to extend the coal-fired stations would place a heavy additional burden on the country's balance of payments.

Work in the Congo

Work on the hydro-electric station at Zilo on the Lualaba River in the Belgian Congo is progressing rapidly, we learn, and the station is expected to begin operating in the early part of 1953. The initial output is expected to be 30,000 kW, but this will be increased considerably towards the end of the year when the entire work should be completed. Another power station in the vicinity is to be built for 1957 on an even larger scale. In addition, the Piana station of the Société Geomines is to have its output increased within three years from 11,800 kW to 33,000 kW. The Société des Forces Hydro-Electrique de l'Est de la Colonie is to undertake the construction, about 100 kilometres from Albertville, of a hydro-electric station on the Kyimbi, and other installations intended ultimately to feed both the Kivu and the Ruanda Urundi. The possibility of utilising the waters of the Matamba River, some 50 kilometres above Matadi, is a long-term project still under consideration, which may well lead eventually to the industrialisation of the whole of the Lower Congo area.

Ten Year Plan for Israel

A development plan for Israel, prepared by a technical committee under the chairmanship of Prof. S. Trone, an American industrial expert, is now being considered by the Israeli Ministerial Committee on German Reparations. The plan is based on the assumption that over $300 million will be obtained from Germany, and in addition about I£445 million will be provided in local currency. The most striking of Prof. Trone's recommendations is for the expansion of electricity generating capacity from the present 126 MW to 600 MW by 1962 at a cost of $150 million plus I£67 million in local currency. He advocates the setting up of an electricity authority "to deal with the whole problem of electric energy from generation to application." It would also consider the possible use of peat and bituminous limestone for power generation. He criticises the "high cost of electricity" in Israel and recommends the installation of nine 50 MW units, to be purchased in the United States, and five 10 MW units from Germany as standby, while the whole distribution equipment would be supplied by German concerns. If his proposals are adopted in full, Israel's electricity consumption would rise from the present estimated 785 million kWh to about 4,000 million kWh in 1962. In the reorganisation of the transport system, he also recommends the electrification of suburban trains, as well as a combination of the electrical system and diesel or steam operation for goods services.

Indian Mica Exports

India exported 408,096 cwt. of mica in the year ended March 31, 1952, a slight improvement on the 406,705 cwt. shipped abroad in the previous year and sharply higher than the 291,726 cwt. exported in 1949-50. The U.S. and Britain took between them about 80% of the total exports in 1951-52 with 177,099 and 147,036 cwt. respectively. Other importing countries were Sweden, West Germany, Italy, France, Japan, Canada and Australia. Yet despite the increase in production, future export prospects are considered not so bright. In Bombay it is believed in the trade that the larger importers have substantial stocks in hand. In addition, synthetic mica, although expensive, is being manufactured in France, and has been the subject of considerable research in the United States. Another factor is the export field in Brazil, although India claims that Brazil can be almost wholly discounted as a serious competitor either in volume or quality. With the poorer export future in mind, Indian mica miners and exporters are attempting to interest the Government in the promotion of exports.

N.Z. Statistics

The annual statistics of electricity development in New Zealand, prepared by the State Hydro Electric Department, shows that in the year ended March 31, 1951, the total units sold to ultimate consumers amounted to 2,446 millions. The number of consumers increased by 21,771 to a total of 576,325 (of whom 494,101 were domestic) during the year, and the average consumption per consumer was 4,245 units. This latter figure is a decrease of 90 units over the previous year. The units sold per head of total population was 1,267 as against 1,256 for the previous year, and practically 99% of the total population is within the area of supply of the various undertakings. During the year a further 20,302 electric cookers and 22,241 electric water heaters were installed in the Dominion, bringing the respective totals to 241,483, and 278,442. At the end of March, 1951, of the domestic consumers 48·87% had electric cookers. Of the 3,096·6 million units generated during the year covered by the report, 2,863·8 millions were from water power plants and 203·5 millions by steam plant.

Firms' Tie-Up

The Japanese Foreign Investment Commission has now approved a plan for a technical tie-up between a Japanese electric machine firm and two West German companies, to which we referred on July 10. Under the plan the Fuji Electric Machine Co. will utilise technique to produce cable and wireless telephone machines from the Siemens Schuckertwerke and the Siemens and Halske companies of West Germany. The West German firms will be permitted to use 20% of the profit from the tie-up for investment in stocks of the Japanese company.

PERSONALITIES

IN THE INDUSTRY

Mr. E. Gray, of E. K. Cole, Ltd., Plastics Division commercial staff, has been appointed to the Export Sales Department, where he will concentrate on plastics exports under Mr. W. W. Syrett, radio and plastics export sales manager. Mr. Gray was assistant buyer for Ekco from 1941 to 1945, and rejoined the company in December, 1948.

Mr. E. Gray

Formerly sub-area testing engineer in the Northern sub-area of the London Electricity Board, **Mr. N. L. W. Hills,** B.SC.(ENG.), A.M.I.E.E., has been appointed district engineer for the Board's City district. He succeeds **Mr. R. C. R. Brooke,** A.M.I.E.E., who has gone to the South-Western sub-area as section engineer, operation and maintenance, for the Wimbledon and Mitcham region, as we have already noted. Mr. Hills started with the former City of London Electric Lighting Co. in 1938. During the war he served in the Navy, and after demobilisation returned to the City company as assistant mains engineer.

Mr. H. E. Duggans, Far Eastern and Central American Divisional Export Manager for Hoover Ltd., who has already made an extensive air tour of the Far East this year, is due to leave tomorrow, August 29, by air for Japan, Hong Kong, Siam and Burma, which tour will bring to some 50,000 the air mileage he will have flown this year. These journeys, which he and other Hoover executives are making, are in pursuance of the company's policy of giving priority to export trade.

This week **Mr. A. Appleyard,** B.SC., has taken up his new duties as second assistant engineer in the co-ordination section, generation construction branch of the chief engineer's department of the B.E.A. at headquarters. For the past four years he has been with the generation design branch, and earlier saw service with the Peterborough and Great Yarmouth Corporations' electricity undertakings.

As the extension of the Merthyr Tydfil factory of Hoover Ltd. is nearing completion (as noted elsewhere in this issue) the company has announced that **Mr. A. R. Northover,** the resident director and manager of that factory, will be assisted in his added responsibilities by the appointment of a works manager. **Mr. F. Austin,** at present works manager of the Hoover factory at High Wycombe, will on September 1 move to Merthyr, where he has been promoted to the position of works manager. **Mr. J. Hallifax,** hitherto production engineering superintendent at High Wycombe, will from September 1 take charge of the High Wycombe factory.

Recent arrivals in this country, **Mr. M. G. Keys,** B.E., A.M.I.E.E., deputy chief engineer, and **Mr. A. S. Don,** B.COM., F.R.A.N.Z., A.C.I.S., secretary, of the Auckland Electric Power Board, New Zealand, are making an extended tour of electricity supply installations and manufacturers' works in Gt. Britain.

Ekco-Ensign Electric Ltd., announce the appointment of **Mr. D. J. Dykes,** of Maldon, as representative for South East Essex. He replaces Mr. J. Dunham who recently left the company's service.

Mr. G. T. Wilson, B.E., A.M.I.E.E., A.M.N.Z.I.E., and **Mr. E. B. MacKenzie,** B.E., M.I.E.E., A.M.I. MECH.E., M.N.Z.I.E., have been appointed assistant

Members of the Council of the Electrical Wholesalers' Federation recently entertained **Mr. and Mrs. W. G. Peirce,** of Philadelphia, at a luncheon and cocktails. Mr. Peirce, of Peirce-Phelps Incorp., is the immediate past-president of the American counterpart of the E.W.F. (the National Association of Electrical Distributors), and after a tour of the Continent he was staying in England for a few days to study methods of electrical wholesaling in this country. Several individual members of the E.W.F. entertained him during his stay, and he was able to visit the offices of two London members and study their systems.

Mr. E. J. Beaver with Mr. and Mrs. W. G. Peirce and Mrs. S. Riley

chief electrical engineers to the New Zealand State Hydro-Electric Department.

Mr. C. H. Robertson, representative of Ekco Ensign Electric Ltd. covering part of East London and an adjoining portion of Essex, has changed his address to 56 Meads Lane, Seven Kings, Essex. Telephone SEVen Kings 1120.

Previously with the General Electric Co. as manager of the Stockport works of Salford Electrical Instruments Ltd., **Mr. J. Foster Veevers,** M.I.E.E., M.I.P.E., M.I.I.A., has joined the Plessey Co. Ltd. and has been appointed general manager of their Swindon Works. The Plessey works at Swindon contains one of the largest automatic machine shops in the country, with a weekly output of some millions of repetition parts. In addition, electrolytic capacitors, volume controls and other radio components are manufactured there.

Mr. J. Foster Veevers

Operating engineer at Kendal power station, North Western Division of the B.E.A. since March 1949, **Mr. H. W. Walker** has now been appointed station superintendent there.

Crypto Ltd., announce that **Mr. C. S. Jordan** has been appointed manager of their Birmingham branch which controls sales and service throughout the West Midlands Area. Mr. Jordan, who joined Crypto in September 1949, has latterly been general sales division representative for Hampshire.

Among three British engineers who left London last week-end to spend six weeks in the United States studying industrial and laboratory techniques is **Dr. R. C. G. Williams,** B.SC.(Eng.), D.I.C., A.C.G.I., M.I.E.E., M.I.Mech.E., chief engineer of Philips Electrical Ltd. The tour is sponsored by the Organisation for European Co-operation and Mutual Security Agency.

At present district manager at Ashford (Kent) to the South Eastern Electricity Board, **Mr. R. Mellor,** M.I.E.E., Assoc.I.Mech.E., has been appointed manager of the Board's recently formed Medway district in succession to Mr. C. Cameron-Kirby, who has joined the Yorkshire Electricity Board at Hull, as we have already noted. Mr. Mellor takes up his new duties on Monday next. Prior to nationalisation of the supply industry, Mr. Mellor was electrical engineer and manager to the Ashford U.D.C., after serving for four years as borough electrical engineer and manager at Kendal.

Formerly with the Barnet district of the Eastern Electricity Board, **Mr. G. J. Hughes** has joined the South Eastern Electricity Board as commercial engineer in the Reigate district of the Surrey sub-area.

On leaving the Northwood district of the Eastern Electricity Board after 17 years service, to become an assistant electrical engineer with the Sudan Electric Light and Power Co. Ltd., **Mr. F. Barlow,** was recently presented with a travelling clock by **Mr. W. T. Langfield,** district manager, on behalf of his colleagues.

The British delegation to the High Authority of the European Coal and Steel Community (Schuman Plan) is to be led by **Sir Cecil Weir,** K.B.E., it has been announced. The other members of the delegation who have been appointed are **Mr. J. Marjoribanks,** Foreign Office, **Miss E. Ackroyd,** Under-Secretary, Ministry of Supply, and **Mr. C. de Peyer,** Under-Secretary, Ministry of Fuel and Power. Sir Cecil Weir was the first Economic Adviser to the British Military Governor in Germany from 1946 to 1949, and subsequently was Chairman of the Dollar Exports Board until that organisation was wound up in June of last year. Miss Ackroyd was from 1948 to 1949 chairman of the Steel Committee of O.E.E.C., and in 1950 director of the Steel and Power Division of the Economic Commission for Europe. The trade unions are expected to announce their representatives soon. Sir Cecil Weir and other members of the delegation hope to arrive at Luxemburg by the beginning of September.

The retirement took place last week end of **Mr. E. F. Bacon,** M.C., Holmfirth district manager in No. 2 sub-area of the Yorkshire Electricity Board, after 44 years' service with various authorities. Following 11 years with the Leeds Electricity Department he went to Hull as chief electrical engineer to the United Premier Oil concern, and in 1927 became commercial manager in the Electricity Department of the borough of Colchester. In May 1933 he was appointed engineer and manager of the Holmfirth U.D.C. electricity undertaking and held that position till vesting day.

Among the Ministry of Supply scientists who have been specially promoted as a tribute to their valuable post-war work, are **Mr. S. B. Gates,** F.R.S., who becomes a chief scientific officer, and **Dr. Francis E. Jones,** M.B.E., B.SC., Ph.D., A.M.I.E.E., who has been appointed a deputy chief scientific officer. The latter was largely concerned with the development of the blind bombing system, and much of the latest electronic radar equipment is due to him. Among those who have been promoted to senior principal scientific officers are **Mr. G. Bradfield** and **Mr. J. S. Preston,** M.A., M.I.E.E., both of the National Physical Laboratory. Mr. Bradfield joined the N.P.L. in 1949 to initiate work on ultrasonics, after considerable experience in industry and at Malvern. Since 1945 he has been engaged on ultrasonic studies and is an acknowledged expert on such matters. Mr. Preston has been at the N.P.L. since 1925, and in recent years has done valuable work on the development of photo emissive cells and selenium cells.

OBITUARY

Mr. J. F. van der Laan, aged 53, Director of Finance of Philips Electrical Industries, Ltd., was killed in an accident at Wezep, in Holland, on August 20. With his death, the Philips concern loses one of its ablest administrators and shrewdest financial experts. Only a short time before he had been appointed a member of the newly constituted Finance Council of the international Philips organisation. He was chairman of the Executive Committee of Finance and Administration of the Philips Group in England, and a member of the Council of the Netherlands Chamber of Commerce. He joined the Dutch Philips concern in the Audit Department in 1924 after some experience in commerce, and during the next eight years travelled widely. Coming to England in 1932 as chief administrator, he was subsequently appointed a director of Philips Lamps (afterwards Philips Electrical, Ltd.) and relinquished this appointment when he became a director of Philips Electrical Industries. In 1947 he successfully carried through the heavy work entailed in the capital reorganisation of the Philips Group in England.

Mr. J. F. van der Laan

We offer our sincere condolences to Mr. V. A. Pask, M.I.E.E., M.I.Mech. E., chief engineer to the B.E.A., on the death of his wife, Nancy Ellen, on August 19.

Mr. C. A. Gillam, a director of Para Electric Railways and Lighting Co. Ltd., and of Tilling-Stevens Ltd., died on August 19.

Mr. R. Redfern, an electrical superintendent with A. Reyrolle and Co. Ltd., has died, aged 48.

Mr. T. G. Young, B.SC., A.M.INST.C.E., F.S.I., A.M.I.E.E., managing director of Kerr & Co. (Maryhill) Ltd., died on August 24, aged 61.

Mr. R. N. Berry, B.SC., M.I.E.E., system design and development engineer to the British Electricity Authority, at headquarters, was drowned while on holiday at Mundesley on August 25.

Mr. G. Morgan, M.I.E.E., who was general manager of Glasgow Corporation Electricity Department from 1940 to 1948, died on August 25, aged 69. Latterly he had been a part-time member of the South-West Scotland Electricity Board.

Pametrada Progress—1951

THE report of the Parsons and Marine Engineering Turbine Research and Development Association shows that 1951 has been a year of intensive work. Most of the development and investigation has, of course, been devoted to marine propulsion and, apart from main engines, attention has to a certain extent been directed toward the design of auxiliary plant. An interesting example of this is the development of a mixed pressure turbo-generator, which can operate on either high or low pressure steam. The design embodies no h.p. cylinder in the conventional sense, a separate group of h.p. nozzles being fitted which utilise h.p. steam in the l.p. stages. Normally the machine runs as a straightforward l.p. set, the h.p. steam only being admitted when there is a shortage of l.p. steam. At the Association's suggestion, this type of turbine has been used for driving the main feed-water pump to give a greater degree of reliability than is usual with the conventional electric motor drive.

Gas Turbines

The 3,500 h.p. marine gas turbine, during the period under review, ran for some 242 hours with the l.p. turbine giving power for 190 hours. An output figure of 3,650 h.p. was attained and held for a period of some 25 hours. It was unfortunate, however, that at this time the 100 hour full power trial was not completed due to component failures. It should, however, be noted that following the period covered in the Report, a continuous 100 hours full power test has been carried out giving a corrected s.h.p. of 3,532, with an h.p. inlet temperature of 1,242° F, an l.p. inlet temperature of 1,284° F with an h.p. turbine speed of 4,650 r.p.m. The average overall thermal efficiency of the set was 27·9% representing a fuel consumption of 0·505 lb/h.p.hr. The designed consumption of this machine was 0·54 lb/h.p.hr, and the best figure obtained to date has been 0·49.

Work in the general gas turbine field has been devoted to investigations into erosion in vortex chambers, combustion chambers and refractory linings. The problem of the regenerative heat exchanger is being attacked, and a study made of the possible use of sodium-potassium entectic alloy as the heat carrier.

Other interests of the Association are concerned with the proving and machining of gear teeth, the measurement of stresses in steam pipes, the development of microphones, turbine blade design and fixing, turbine water drainage and steam expansion joints.

Supply and Utilisation

Recent E.R.A. Reports of Interest to Supply Engineers

SUBJECTS of interest to electrical engineers engaged in the generation, transmission and utilisation branches of the industry are covered by the latest batch of reports to be released for publication by the Electrical Research Association. Perhaps the most important is "Network analyser study of inherent restriking voltage transients on the British 132 kV Grid" (Ref. G/T264). In this, Messrs. L. Gosland, B.Sc., M.I.E.E., and J. V. Vosper, B.Sc.(Eng.), A.M.I.E.E., summarise the results of a study of three B.E.A. Grid substations (Hams Hall A, Coventry and Willesden), and include also an appreciation of the probable effect of the addition of the proposed 275 kV superimposed Grid.

In the investigation, the networks concerned were set up on the E.R.A.'s pilot multiple frequency network analyser. The transient appropriate to the network in question was then obtained by means of a restriking voltage indicator. Hams Hall A and Coventry were chosen as typical of stations likely to have high rates of rise of restriking voltages. At both, the rates of rise are determined mainly by local generation, in-feed through a local reactor, and in-feed through long lines. Willesden was chosen because it represented a wide variety of conditions.

Peak Values

In its results, this survey suggested that rates of rise of voltage up to 7·5 kV/microsec at amplitude factors up to 1·7 can exist at up to 400 MVA (amplitude factor is the relationship between crest value of transient and the peak value of the fundamental frequency recovery voltage). Such rates of rise were associated entirely with reactor circuit-breakers. Rates of rise of voltage of about 4 kV/microsec exist up to about 50% of the total short-circuit MVA on any one busbar, but in present conditions, rates of rise at maximum MVA values for a given busbar are usually less than 1 kV/microsec with amplitude factors up to 1·8.

Superimposition of the 275 kV system will result in greater sub-division of the 132 kV Grid, both by physical separation of sections and by the use of reactors. In consequence, the proportion of stations at which important amounts of MVA are fed through local lumped reactance is likely to increase. In such cases rates of rise up to 4 kV/microsec at amplitude factors up to 1·8 are to be expected.

Pulverisers

Generation is covered by a report (P/T105) based on replies to a questionnaire on commercial pulverising experience. Although only recently released for publication, this report was completed at the end of 1947. In its results, it showed that industrial pulverisers were invariably air-swept, and that the majority operated on closed circuit. About half of the total output came from medium-speed mills, and only a small proportion from high-speed.

It was not possible to establish any connection between mill power and coal type, or the conditions of operation of the pulveriser. There was a general tendency for fan power to increase for low-speed mills and decrease for medium-speed mills as mill power decreased. High moisture in the feed appeared to have two effects: clogging in the feed or mill, and reduction of output.

Electricity and Lettuces

Finally in this trio of reports comes soil warming for salad crops in frames, which has been studied by Mr. A. E. Canham, M.Sc.(Eng.) (Report W/T24). In the investigation, a fixed daily "dosage" of heat was supplied to the soil in pre-cast concrete frames, no attempt being made to keep soil temperature constant. The object of the experiments was to ascertain whether improved results could be obtained by using different dosages or planting dates from those that had been previously recommended.

There was no significant difference in the total number of lettuces cut from the different treatments (75 watt hr/ft²/day, high; 56, medium; and 37·5, low. Further variations were starting high and finishing low, and vice versa). By using the high dosage instead of the low, an average gain of 7-10 days in time of readiness was obtained for double the energy consumption. There appeared to be no advantage in employing a dosage which varied throughout the growing period.

In effect, these experiments confirm previous recommendations that for commercial purposes dosages of 40-45 watt hr/ft²/day (50-55 in the north) should be used.

The BUYER'S *Column*

A New Lantern Battery

THE range of lighting batteries made by The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, has been augmented by the introduction of the BA 6120 6-V lantern battery. This is suitable for the supply of current for portable lanterns and also to operate miniature electric motors in models and toys demanding a compact, heavy-duty battery.

Welding on the Spot

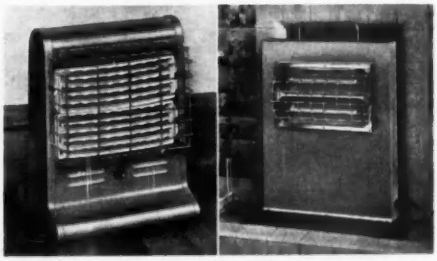
SPOT welding to be carried out on large assemblies has often presented problems when the usual type of spot welder has been found unsuitable. Cases in point are welding motor bodies to chassis members or repairing motor-car wings, etc. To overcome these difficulties, MERITUS (BARNET) LTD., Barnet, Herts, have recently introduced the "Meritus" portable plier welder, with which a considerable saving of material costs should be effected.

To use the machine, the operator, by depressing the lever on the pliers, clamps the pieces to be welded between the working electrodes. This applies welding pressure and at the same time initiates the welding cycle. For manual operation the current supply is switched off by releasing the lever, but, if an automatic control is desired, an electronic weld timer can be supplied. Although this is primarily designed as a portable tool, a steel pedestal to which the jaws may be attached can be also supplied as an extra so that repetitive welding on a small production scale can be performed. Part of the standard equipment issued with this machine is a "Pushweld" attachment for welding large surfaces, where it may be difficult to position electrodes on both sides of the metal. The welder is designed for a 400 V input, but can be supplied for other voltages.

The ease of handling of the new "Meritus" portable plier welder is well demonstrated in this illustration

Fires With Guards

QUICK off the mark, in anticipation of regulations to be laid down in the Fireguards Act, BRITISH NATIONAL ELECTRICS LTD., Charlton, S.E.7, announce that all models in their range of electric fires are now fitted with electric guards. These guards are stated to conform to requirements stated in B.S. 1670: 1951.



Models F. 102 (left) and F. 43 with new guards

To meet any immediate demand, the company's branches are already being supplied with all models. Current prices of fires complete with guard and six feet of flexible cord are, for Model F.101, £3 9s. 6d.; Model F.102, £4 19s. 9d.; Model F.103, £9 19s. 6d.; and Model F.43, £9 11s. All prices include purchase tax. It is pointed out that no guard is necessary for B.N.E. portable convector P.20, a recent introduction, as no accessible part of this heater reaches a high temperature.

Reductions in Price

FOLLOWING improvements in manufacturing methods, the Communications and Industrial Valve Division of MULLARD LTD., Century House, Shaftesbury Avenue, W.C.2, have announced as from August 1, 1952, further reductions in the list prices of their range of photocells used in various sections of the instrument and engineering industries. The new list prices are as follows:

Type 20CG, 35s.; 20CV, 35s.; 58CG, 30s.; 58CV, 30s.; 90AG, 45s.; 90AV, 45s.; 90CG, 24s.; 90CV, 24s.

AN announcement from T. B. MORLEY AND CO. LTD., Jameson Street, Hull, states that prices of their products have been revised. To come into

effect on September 1, 1952, the revision includes reductions in most of their existing prices. New price lists will be available almost immediately.

OPERATING from August 7, 1952, Ekco-Ensign Electric, Ltd., Southend-on-Sea, Essex, have reduced the price of their Decoration Lights sets from 21s. to 18s. 2d. per set, purchase tax now being 4s. 2d. The price of Joy Lights sets remains unchanged at 28s. 6d. per set, plus purchase tax of 6s. 6d.

A Larger "Nylux" Range

PUBLICATION of a new list illustrating the range of productions for the forthcoming season by KNIGHTSHADES, LTD., Derby Road Works, Montagu Road, Edmonton, N.18, draws attention to the extended range of shades in this new material exclusive to the company.

Over 20 different shapes, sizes and designs of pendant table lamps and standard lamp shades are available in "Nylux" in five different colours, whilst there are many other designs available in "Lumex" and glass.

The range includes in addition to styles mentioned earlier, table lamps, complete bed lights, candle shades and glass/wood decorative pendant and wall fittings.

TRADE PUBLICATIONS

MAKING ELECTRIC LAMPS.—What goes into the manufacture of the filament lamp or fluorescent tube? "Osram Lamps in the Making," a booklet recently issued by the General Electric Co., Ltd., Magnet House, Kingsway, W.C.2, tells the fascinating story of the production, in all its stages, of these types of lamps.

DETERGENTS FOR BOILER WATER TREATMENT.—A series of booklets by Albright and Wilson, Ltd., 49 Park Lane, W.1, sets out the properties, uses and applications of "Calgon," a detergent which can be used to soften boiler water. Also available are details of other chemicals prepared by the company and a comprehensive list of their products.

TRUCKS FOR ALL PURPOSES.—Illustrated in this catalogue are trucks and wagons built by H. H. Stark, Ltd., 193 Whitechapel Road, E.1. Among types shown are to be found sack and warehouse trucks, bogie trucks for factory, general and domestic use.

SOCKETS AND SWITCHES.—A folder prepared by New Day Electrical Accessories, Ltd., 136 Mary Street, Birmingham 12, sets out details of their Micro-Gap tumbler switches and types of sockets, including their Fireside Triple Socket. A companion folder lists their consolidated prices.

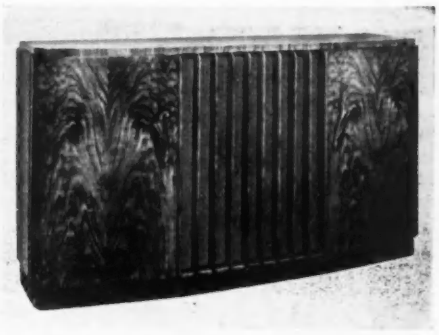
FERGUSON "500" FOR QUALITY SOUND

INTRODUCED almost a year later than the "300" RG, the Ferguson "500" RG autoradiogram marks a considerable development in the technique of sound reproduction. Made by THORN ELECTRICAL INDUSTRIES, LTD., 233 Shaftesbury Avenue, W.C.2, and marketed at 248 gns. (inc. tax), the "500" RG incorporates features in which limitations of cabinet, speaker and pick-up design present in the earlier "300" RG have been largely overcome.

Constructed in walnut and birds-eye maple, the cabinet is a horizontal console, 4 ft 10 in. wide, 2 ft 10 in. high, and 1 ft 5½ in. deep. Doors on each side of the central speaker grill open outwards to reveal, on the left, the controls and radio receiver dial, and on the right the record-playing equipment and storage space for 140 records. In the latter, a Garrard three-speed automatic record changer RC80 is used, fixed to a tray which slides out for accessibility. Two pick-up heads, for standard and long-playing records, with semi-permanent sapphires are supplied.

Consisting of a nine-valve circuit with push-pull output supplying 14 watts maximum, ample for small halls, the receiver covers from 15·7 to 2,050 metres wavelength in three bands. Harmonic distortion at full output, undetectable by ear, is stated to be as low as 1% falling to 0·35% and 0·1% at 10 W and 6 W respectively. Controls provided are a five-position filter control and bass and treble controls for flexibility in tone, in addition to the volume, tuning and selectivity controls, wavechange and on-off switches.

A double-speaker unit, aimed at assisting the overall audio-frequency response, consists of a 12 in. bass speaker limiting at 1,000 cycles and a 5 in. treble speaker extending the range to 10,000 cycles. At a recent demonstration under the ideal conditions of the Festival Hall, at which a selection of standard and l.p. recordings was played, it was noted that both bass and top responses were of a high standard. The flexibility of the instrument was well shown, although the tone controls require judicious handling to obtain the best performance.



Neat and attractive appearance of the Ferguson "500". The decorative handles are of cast bronze

NEW LITERATURE

Industrial Magnetic Testing

by N. F. Astbury, M.A., M.I.E.E., F.Inst.P.

IN a becomingly modest preface to this monograph, the author claims as one of his achievements the analysis of some problems in magnetic testing "so that one might see what is, and what is not, being taken for granted." This most valuable and welcome approach is apparent throughout an easily readable and interesting text which should be of the greatest value to all who have to concern themselves with magnetic testing. Early chapters are concerned with the basic information proper to such work : the general concepts of modern magnetic theory are discussed, there is an analysis of the magnetic circuit and its associated electrical circuit, and the commoner instruments used in magnetisation experiments are reviewed. The remainder of the book is concerned with testing methods and technique, under the headings permeability and hysteresis; power loss; a.c. bridge and potentiometer, and permanent magnets. As already indicated, the approach throughout is critical and, therefore, largely mathematical; but the presentation is clear, and the results make the effort involved well worth while. Published by the Institute of Physics, 132 pages, 9½ in. by 6 in. Price 25s.

Three Phase Motors

by T. F. Wall, D.Sc., D.Eng., M.I.E.E.

ATTEMPTED in this book is no less than a mathematical description of the complete range of three-phase motors used in industry at the present time. This aim is sufficiently well realised for this new work of Dr. Wall's to be recommended to advanced students as most valuable reading. For them, it has the specially attractive qualities of making it always quite clear what the mathematics is about, and of lightening some arid wastes of theory with oases of notes on practical construction and design characteristics.

Naturally the induction motor receives the greatest attention, almost half the book being devoted to this machine in its two main types, and to related problems of starting, braking and speed regulation. More briefly, Schrage and other commutator machines, synchronous motors, and "selsyns" and similar devices receive attention, in every case fields of application being discussed as well as theory of operation. Some recent developments in motor control (developed on the continent during the war) receive special attention. Published by Newnes, 232 pages, 8½ in. by 5½ in. Price 30s.

Earthing Principles and Practice

by R. W. Ryder, B.E., B.Sc., A.M.I.E.E.

PERHAPS the greatest danger associated with earthing is that its simplicity is too readily taken for granted. If he had only drawn attention to the problems underlying the use of the "earth plate," Mr. Ryder would have performed a valuable service to the industry. He has, however, gone far beyond this. In a simply written volume, he has provided a useful reference book in which will be found the answer to many queries that arise when considering the earthing of an installation. Both theoretical questions of earth circuit resistance and its measurement, and practical considerations of cost and efficiency are considered. Published by Pitman, 108 pages, 8½ in. by 5½ in. Price 15s.

Calculation of Unsymmetrical Short Circuits

by H. Rissik, Hons. B.Sc. (Eng.), M.AMer.I.E.E.

2nd Ed. revised by W. F. Lovering, M.Sc., A.M.I.E.E.

ALTHOUGH the value of the first edition of this book has been established beyond doubt, changes made in this edition will be of considerable assistance to the reader in following original arguments. Substantially, the book is unaltered in style or exposition. The first change to be noticed is the addition of a simple proof showing that three vectors may be resolved into symmetrical components. Considerable expansion has been made also to the section on phase-sequence impedances of synchronous machines. Definitions of terms have been added throughout.

The book itself shows how current and voltage conditions under an asymmetrical fault can be determined using symmetrical component methods. Three types of asymmetrical fault are analysed and symmetrical impedance equivalents are derived for each case. Considering a power network, calculations are made of sequence impedances for its component parts. To show how fault conditions are evaluated in practice, a numerical example, based on a hypothetical fault between Nechells and Hams Hall stations, is worked out in full. Finally, consideration is given to short-circuit currents and terminal voltages of generators under fault condition. Published by Pitman, 55 pages, 8½ in. by 5½ in. Price 12s. 6d.

BOOKS RECEIVED

Electrical Appliances: Installation and Maintenance, ed. E. Molloy. Review of routine for domestic equipment. Published by George Newnes, 196 pages, 9 in. by 6 in. Price 17s. 6d.

Electrical Engineering, by C. V. Christie. General textbook for engineering students. Published by McGraw-Hill, 675 pages, 9 in. by 6 in. Sixth edition, price 59s. 6d.

Electrical Equipment of Buildings, ed. E. Molloy. General review for installation engineers. Published by George Newnes, 260 pages, 9 in. by 6 in. Price 17s. 6d.

The WEEK in NEWS

DISPUTE AT KINGSTON "B"

A DISPUTE involving about 40 maintenance men at Kingston 'B' power station, South Eastern Division of the B.E.A., over an improved works office organisation, was settled last week. Ten men had been given a week's pay in lieu of notice when they refused to comply with a general directive of the management on the new procedure, the Authority stated. The men had been given the opportunity of altering their decision. But following a meeting with trade union officials they agreed to return to work. The new system is to be operated for a trial period of three months when the management will review the situation, we understand.

Rise for Draughtsmen

AN increase in pay of 12s. 6d. a week to draughtsmen of 21 years of age and over, with proportionate increases to tracers and to juvenile workers, has been awarded by the Industrial Disputes Tribunal. The Association of Engineering and Shipbuilding Draughtsmen had claimed an extra 14s. a week for adult employees of firms represented by the U.K. Joint Wages Board of Employers for the vehicle-building industry and proportionate amounts for younger employees, so as to bring their members into line with drawing office workers in the engineering industry. The employers offered 11s. a week.

Announcing the award, the tribunal says the claim has not been established. The award is back dated to January 9, but the tribunal adds that any increase in wages other than for individual merit which have been granted since that date should be merged in the increase provided in the award.

Abolish p. tax on Water Heaters!

N.W. Consultative Council's solution to fall in demand

CONCERNED by the alarm felt by engineers in the supply industry at the fall in demand for electricity, the North Western Consultative Council have debated the matter and arrived at the conclusion that the domestic off-peak load could be increased if purchase tax was removed from certain domestic electrical appliances.

Alderman Regan said that purchase tax had been imposed on many electrical appliances with the object of restricting their sale and hence keeping down the demand at all times. He held the opinion that a case could now be made out for the abolition or reduction in tax on appliances which did not add to the peak load.

Mr. A. O. Johnson, Chief Commercial Officer, emphasised that, although many reasons were given for the variations in purchase tax, the last increase was imposed with the aim of a reduction in sales of appliances which would facilitate manufacturers turning over to rearmament work. In his opinion fuel economy would be gained if tax was removed from electric water heaters, whilst washing machines were definitely fuel and labour savers.

The council has passed a resolution which it intends to publicise well, calling on Government departments to reconsider their policy regarding tax on electrical appliances with particular reference to the abolition of the tax on electric water heaters and washing machines which saved fuel and labour and were mainly used outside peak hours.

MORE METER READERS REDUNDANT

A FURTHER 26 meter readers who have been declared redundant, have been given a month's notice by the London Electricity Board. These are in addition to the 26 discharged earlier this month as a result of which a protest strike was threatened. The Board has stated that despite unofficial action it will continue to deal with the question of redundancy among meter readers, and has already emphasised that they regard the existence and extent of redundancy as a matter to be decided by the management.

The First Half-Century

The abandonment of the electromobile trials for the present year, after repeated postponement, is much to be regretted by all who take interest in this promising industry. The interest taken therein by the proprietors of the ELECTRICAL TIMES has been put to practical proof, and to myself and other members of the staff the disappointment is a personal one. How far it might have been averted had the Automobile Club shown a little more energy in inviting entries, this is not the place to enquire, but it is to be feared that much encouragement will be given by the fiasco to those who preach that in this branch of the electrical industry we are behind our American cousins. That, at least, I do not believe to be the case, and it rests with the makers of electric automobiles to take care that no similar backwardness on their part shall interfere with the successful holding of the trials next spring.—*From our issue of August 28, 1902.*

FULL TIME AT MERTHYR

HOOVER'S washing machine factory which in mid June went on short time, four-day week working, has now returned to a five-day working week.

This move, which is due to the company's confidence in future market conditions, is strengthened by staff changes and appointments which are recorded elsewhere in this issue.

Building work at the Merthyr Tydfil factory now nearing completion will bring the total floor space there to 200,000 sq ft approximately, making the factory three times as large as it was when opened in 1948.

Encouraging Prospects in Egypt

A SUBSTANTIAL market exists in Egypt under the general heading of electrical machinery and apparatus according to the latest Economic Survey of that country just published by H.M.S.O. In 1949 and 1950 the total imports reached a value of £E6.3 million and £E6.8 million respectively. Probably the most valuable section of the trade is that of generators, motors and transformers, and with a tendency towards further industrialisation, together with proposed extentions to power stations a large demand for such equipment appears to be ensured. As regards power stations, it should be noted that the five-year plan for Egypt includes an expenditure of £E1,320,000 on the New North Cairo station.

In other fields prospects are also encouraging. The building programme, for instance, indicates a steady demand for electric lifts. Such items as refrigerators, fans, toasters, heaters and irons are in considerable demand, particularly refrigerators. Despite the relatively high cost of current, there is little doubt that the market is steadily expanding. Concerning the country's own electrical industry, there are three main firms engaged in the manufacture of apparatus and fittings and there is a large local production of lamps.

Ministry Offer Electronics Apprenticeships

Under a new scheme intended to produce qualified electronic engineers and technicians, the Ministry of Supply is to offer five-year apprenticeships in electronics to boys between 16 and 17 years of age.

The scheme is to meet an industrial need which the Ministry believe will become increasingly important with the growing use of electronic equipment.

The first twelve months will be spent on engineering craft work at a M.o.S. research establishment or ordnance factory followed by four years training at the Malvern School of Electronics. This should enable apprentices to obtain their O.N.C. in Mechanical and Electrical Engineering and then the Higher National certificate in Electrical Engineering with emphasis on electronics.

Applicants who should possess or expect to possess the General Certificate of Education in Mathematics and Physics or Science at ordinary level should apply before August 30 to the Departmental Training Officer, Ministry of Supply, 66 Gower St., W.C.1.

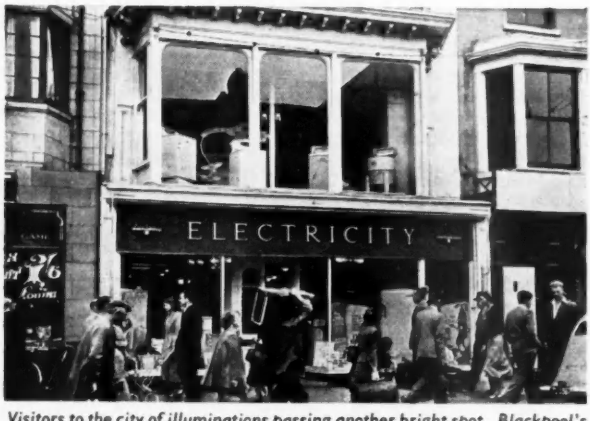
June Radio and T.V. Sales

COMPARED with last year the sales of radio receivers during June have dropped considerably being 4.58 sets sold per shop as against 6.31 in 1951. On the other hand sales of television receivers show only a small difference per shop at 3.15 against 3.32 in 1952. The apparent stabilisation in T.V. sales is most probably due to the balance brought up by sales in the Kirk O' Shotts and Wenvoe reception areas.

Restrictions on Copper Usage Now Lifted

FOLLOWING the approval by the Council of O.E.E.C. of a common list of copper usage prohibitions adopted last year by member countries, many of the prohibited articles are now removed from the list following improvements in the world supply position of copper and copper alloys.

This material can now be used for all plating operations, and for the manufacture of many items coming under the headings of builders and miscellaneous hardware furniture and motor-car fittings, together with certain household articles and electrical appliances.



Visitors to the city of illuminations passing another bright spot. Blackpool's new Service centre recently opened by the N. Western Electricity Board at Talbot Road affords facilities for normal consumer service, the payment of accounts, and demonstrations in a room seating 60 persons

OFFICIAL PUBLICATIONS

E.R.A. REPORTS. G/T 264. Network Analyser Study of Inherent Restriking Voltage Transients on British B2kV Grid, by L. Gosland and J. S. Vosper, price 10s. 4d. L/T 255 Excitation Temperatures of Hydrogen Arcs, by H. Edels and J. D. Creggs, price 12s. 4d. P/T 105 Commercial Pulverising Experience, price 15s. 4d. W/T 24 Electrical Soil Warming for Salad Crops in Frames, by A. E. Canham, price 9s. 3d.

N.P.L. Maintenance of Standards. Proceedings of symposium on developments and techniques. H.M.S.O. 4s. 6d.

HOUSE OF COMMONS PAPERS. 294. Iron and Steel Corporation Report and Accounts for 1950-1951. H.M.S.O. 3s.

Iron and Steel Prices Order No. 2, 1952. No. 1554, H.M.S.O. 2d.

H. Fisher (Oldham)—An Explanation

A RECENT press notice concerning H. Fisher (Oldham) Ltd. may have created some misunderstanding among their customers. It is correct that the firm suffered very considerable losses on account of heavy cancellation from foreign markets such as Australia and others suddenly restricting the import by Government decrees, we are told. For this reason it has been necessary to appoint two Receivers for the debenture holders with the intention to reorganise the company under the management of Mr. F. Lloyd-Kessel.

The Receivers and Mr. Lloyd-Kessel stress that there is no intention of liquidating the company. On the contrary all services are continued as hitherto and it is hoped to overcome the present difficulties with a well-advanced development programme. Further information concerning the status of the company can be obtained from Messrs. J. B. Brierley and A. Riley (joint Receivers) C/o H. Fisher (Oldham) Ltd., Oldham, Lancs.

THE NEW SEASON'S LAMP CAMPAIGN

DETAILS have been released by Crompton Parkinson and Metropolitan-Vickers Electric Co. of their lamp campaigns for the coming autumn lighting season. "Switch to Crompton Lamps" is again the slogan which will be featured in advertising to the general public, while a new six-colour counter display is being made available to retailers.

Metrovick lamps will be presented under the theme "Best light in the world, Daylight," with their familiar slogan, "When daylight fades, . . . Metrovick lamps." In Press advertising, the quality control theme started last autumn is to be continued. Both firms offer new lamp price lists and counter leaflets.

This attractive display piece has been issued by Philips Electrical Ltd. Approx. 23 in. by 18½ in., it is a hinged baseboard on which the shaver is displayed; or, with baseboard folded back, it becomes a self-contained showcard

METAL PRICE CHANGES

The new Iron and Steel Prices Order (No. 2), 1952, announced by the Ministry of Supply came into force last Monday.

Prices of various alloy steels have been altered to take account of changes in production caused by restriction on the use of nickel and molybdenum and the increases in the prices of alloy materials.

Blast furnace ferro-manganese is released from statutory control, prices in future being fixed by agreement between the makers and the M.o.S.

An order has also been made reducing the prices of brass, brass scrap and gilding metal scrap. Prices of 60/40 brass and brass scrap are reduced by £4 per ton, all other grades by £3 per ton and gilding metal scrap by £1 per ton.

Speed Supplies to Rural Areas

A RESOLUTION calling for greater progress in rural electrification with particular reference to greater output per man in the outdoor gangs, was discussed at last Thurday's meeting of the South-West Scotland Electricity Consultative Council. Proposing the motion, Mr. W. Young, a farmer, of Kilmarnock, maintained that the best brains of the industry were concentrated on the improvement of plant and equipment, but there was no improvement in the method of installation. He was not casting reflections on the men on the job or on anyone else, but he thought the question of reorganisation of the methods employed might well be studied. Another member pointed out that in America they had machines which dug a hole, inserted the post, and packed the base with soil while men prepared the cables. With such machines they could erect poles five times as quickly as in this country. He understood there was at least one such machine operating in the south of Scotland.

A letter, giving the line of the discussion is being sent to the Board, and Bailie A. B. Mackay, chairman of the Consultative Council, said he would amplify it when the matter was raised with the Board.

An interesting comparison of the cost of an all electric house and a gas/electric house was noted during discussion on services to new housing estates. At Udston Hillhouse Scheme, of Hamilton Town Council a gas/electric house totalled £51 5s. as against £37 16s. for the all electric house.

Electric Harpoons Adopted

AS a result of the success met during experiments on the use of electric harpoons in whaling (see ELECTRICAL TIMES, April 17, May 22 issues) the method will be adopted as regular practice when the Antarctic season begins this December.

Sixteen of the catcher ships of United Whalers Ltd., which accompany the parent factory ship will be re-equipped with the apparatus although only one ship, of the Setter Class, will be fitted this year.

The chairman of the company, Sir Vyvyan Board, and Mr. R. Marsden, on the staff of the General Electric Co. Ltd., who co-operated in the design of the electrical equipment accompanied the expedition which has just returned from the north Norwegian coast. Evidence of the success of the method is apparent from the fact that one of the whales caught was the biggest taken in the area this year.

As was noted in our April 17 issue, the advantages of electric harpooning include instant death, elimination of playing the whale, quicker completion of the catch and the absence of shrapnel in the flesh.

Six-Weeks' Lighting Course in Leeds

THE programme for another Illumination Design Course at the Lighting Service Bureau in Leeds, has just been announced. The course will consist of six lectures which will be given on consecutive Wednesday evenings beginning on October 8. The first will be on "Light and Sound" by Mr. R. L. C. Tate, the second on "Design" by Mr. J. W. Howell, and the third on "Fluorescent Lamps" by Mr. A. D. S. Atkinson. Mr. Howell will also deliver the fourth and fifth lectures on "Light Control" and "Lighting for Production." Finally there will be Mr. A. D. Charters talk on "Offices and Schools." Applications for reservations and further details should be addressed to the Lighting Service Bureau, 24 Aire St., Leeds 1.

Ladies! Can you read a meter?

LAST year the Electrical Association for Women held some successful evening courses where they gave practical instruction in meter reading and fuse mending to housewives and added hints and information on the use of domestic electric appliances.

These courses were well attended so E.A.W. have decided to continue them this year. The tuition is free of charge and will be held in two series on Tuesday evenings from 6.0 p.m. to 7.0. p.m. the first commencing October 14, for three weeks and the second November 4 for three weeks.

In order to ensure individual tuition the size of the classes will be limited.

Application should be made as soon as possible to the Housecraft Department, E.A.W. 35 Grosvenor Place S.W.1.

N.Z. IMPORTS CHANGES

AN announcement from Wellington by the New Zealand Customs Department gives details of goods which will be considered for the grant of licences on a token allocation basis for imports from the United Kingdom.

Included in the revised list of items issued under the 1953 Import Licensing Schedule are the following items: Transformers for radio receivers, battery chargers, batteries or cells other than hearing-aid batteries, storage batteries and "B" batteries for portable radios, transformers, chokes, R.F. coils, R.F. units, valve shields, loudspeakers, and other radio components, complete radio receivers with or without cabinets, electric irons other than travelling irons, steam irons and no cord irons, insulators, filament lamps, domestic vacuum cleaners, electric cooking and heating appliances (excluding ranges), hot plates for glass coffee brewers, toasters which embody an automatic ejector, electric pressure cookers, plate warmers and hot plates not exceeding 500 watts, waffle irons, oil-filled electric radiators, electric fan-heaters, domestic food warmers, kettles, tea and coffee makers, with automatic thermostatic cut-out, appliances for boiling liquids being small, glass or metal containers 12 oz. capacity with an immersion heater affixed to the lid, and washing machines.

Evening Courses for Graduates and Executives

FOLLOWING the receipt of the L.C.C.'s handbook on evening courses provided by them, which we noted last week, we now have obtained details of some courses of lectures to be held at the Sir John Cass College, Jewry Street, London E.C.3, which may interest our readers.

A. G. Maddock, PH.D., A.R.C.S., D.I.C. of the Radiochemical Laboratory at Cambridge, is giving a series of eight lectures on Radiochemistry and Radioactivity each Tuesday evening at 6 p.m. beginning October 7. Fees for this course is £1.

R. Phillips, Esq., B.SC., is in charge of Practical courses in the Basic Techniques of Radiochemistry which are intended for graduates in chemistry, physics, botany or zoology who wish to obtain practical experience. These are either ten-week courses (Thursdays 6-9 p.m.) or five weeks (Tuesdays 2-5 p.m., and Thursdays 6-9 p.m.) commencing Tuesday, October 7. Fee is £2 10s.

A course of 12 lectures on Industrial Law by Eric Walker, M.A., B.C.L., is addressed to men and women in executive positions in industry.

For those preparing for the Institute of Brewing examinations, an afternoon and evening course of lectures on Engineering, including Fuel and Power, has been arranged, commencing Wednesday, October 1. The first continuous series (24 lectures) from 4.15 to 5.15 p.m. and 5.45 to 6.45 p.m., will be given by D. M. Reid, M.I.MAR.E., on Boiler House Equipment, Fuels, Power and Refrigeration.

E.I.B.A. in 1951

NEWLY elected President of the Electrical Industries Benevolent Association, Mr. R. H. M. Drake, in one of his first presidential letters revealed that the Annual Report shortly to be published shows that assistance from the funds exceeded last year's figure by 13%.

Last year beneficiaries of E.I.B.A. received £41,500 in money alone—an impressive sum which made Mr. Drake realise the magnitude of the task before the electrical industry this year.

He stressed the need for regular subscriptions and called on all those in the industry who are not regular subscribers to join the association straight away and thus ensure that the work of the association kept pace with the ever-increasing demands for its help.

NEWS IN BRIEF

The next meeting of C.I.G.R.E. 15th session will be held in Paris from May 12—22, 1954.

The Worshipful Company of Goldsmiths invite designs for a commemorative rosewater dish and ewer to be presented by B.E.A.M.A. to Cambridge University in connection with the endowment of a Chair of Electrical Engineering.

In place of their monthly meeting on March 23, Leicester branch of the Illuminating Engineering Society are holding a meeting and exhibition for the local trade on "Display Lighting for the Coronation." The branch invites manufacturers of Coronation display material to join them at this exhibition where space and electricity will be provided free.

E.M.I.'s associated record companies have now entered the long-playing record field with the introduction in October by H.M.V., Columbia, Parlophone and M.G.M. of 10 in. and 12 in. long play 33⅓ r.p.m. records with a duration of 35 and 50 minutes respectively, and an unbreakable 7 in. 45 r.p.m. record which is lighter and flexible and has a playing time equivalent to standard 78 r.p.m. records.

Three-week courses for welding engineers, supervisors, inspectors and foremen are to be organised by the Quasi-Arc Co. Ltd. of Bilston, Staffs.

Half the time is allotted to technical and theoretical work and half to practical welding experience. The next course commences on October 27.

Company Activities . . .

Christy Bros.

Group profit for the year to March 31 last is £23,802, compared with £32,176 for the previous year; after providing for taxation of £34,142 (*£40,339*) there is recommended a dividend of 7% on the Ordinary capital, which was increased by £50,000 to £200,000 by an issue of shares for cash. The previous year's distribution was 6% on the old capital and 1½% on the new. The sum of £1,000 transferred last year to deferred dividend reserve has now been utilised in paying the year's dividend. There is £27,068 (*£23,429*) carried forward.

A. C. Cossor Ltd.

The company is resuming dividends on the Ordinary capital, with a recommended 10% for the year to March 31 last. There have been no Ordinary dividends for the four previous years. The group trading profit for the year is £482,876 (*£473,549*), which, with other income, is raised to £487,977 (*£481,169*). After deducting depreciation, audit fee, etc., the balance is £352,768 (*£374,601*). Add profit on sale of investments £8,133 (*£1,571*), on sale of property £897 (*nil*), adjustments £25,157 (*£16,138*), and with £48,348 brought in there is £435,303 available. To taxation £237,801 (*£220,498*), and subsidiaries' general reserve gets £10,000 (*nil*). The sales turnover for the year was the highest in the company's history, the chairman, Lord Burghley, states. On the electronic engineering side much of the year was spent in preparatory work for certain large Government contracts on which production only started at the end of the year. Orders in hand and in prospect should keep this side of the business well occupied for a considerable time to come. But with the expanding business the working capital is being found inadequate, and the directors are considering how best to provide the necessary capital resources.

Dubilier Condenser Co. (1925)

Current assets at March 31 last amounted to £802,005 (*£518,641*), of which stocks and work in progress accounted for £341,285 (*£199,063*). Current liabilities are listed at £280,318 (*£187,179*). Total output for the year was an all time record, according to Mr. W. H. Goodman, chairman, and the concern obtained a larger quantity of export orders. Keen competition has to be met both at home and abroad and in the latter part of the year there was a reduced flow of orders from customers in the radio industry, he states. The current financial year has started in good shape with output from factories maintained at a high level, he adds.

George Kent Ltd.

The consolidated trading profit, etc., for the year ended March 29 last, is £381,358 (*£483,481*), which is increased by other income to £411,606 (*£483,729*). After charging depreciation, amortisation and off fixed assets £77,180 (*£72,897*), debenture interest £7,997 (*£8,171*), employees

pension scheme £33,998 (*nil*), taxation £155,465 (*£237,056*), etc., the net profit is £134,665 (*£153,870*). The final Ordinary dividend is 9½%, making 12½% (*same*).

Pinchin Johnson and Associates

New records were established for volume and value in the year ended March 31 last, and but for the continued shortage of raw materials the company would probably have recorded even better results, Mr. G. R. T. Taylor, chairman, has stated. The cost of raw materials and other expenses of production again increased substantially, while the margin of profit per unit of output further declined. The record net profit of 1951-52, which we noted on July 17, was created by small returns on a high volume of output.

Pirelli-General Cable Works

A substantial increase in the profit for the year to March 31 is shown in the preliminary statement. After charging depreciation, etc., but before taxation, the net profit for the year is £1,516,558 as compared with £961,653 for the previous year. Taxation absorbs £731,228 (*£606,301*) and reserve for tax *re* initial allowances £13,250 (*£22,850*), leaving a balance of £772,080 (*£332,502*). The dividend is again 8% plus a bonus of 12%. Reserves receive £700,000 (*£250,000*), leaving £825,830 (*£632,388*) carried forward.

Pye Ltd.

A final dividend of 3% and a participating dividend of 2% on the 8% Participating Preferred Ordinary stock, are recommended for the year ended March 31 last, making, with the interim, a total of 10%. There is also recommended a dividend on the Deferred Ordinary stock of 18% which includes 5½% paid out of the Deferred Ordinary dividend reserve (*same*). The group profit for the year, before tax, is £611,039 (*£541,930*). Taxation absorbs £448,820 (*£358,316*), and the group net profit is £162,219 (*£183,614*), of which £160,579 (*£184,734*) is attributable to the parent company. The profit-sharing distribution to employees takes £21,000 on the revised basis (*£32,000*).

Radio & Television Trust

Although an earlier group loss has been converted into a profit of £35,545 at March 31 last, there still remains an adverse balance of £790,210, mainly a reflection of operations in 1948-49. The board considers there are two methods by which this loss and the corresponding overdraft—£921,442—might be dealt with. One, to sell the operating companies and pay off the overdraft, the board thinks would be a mistake at the present time. The other course would be continual development of the companies by which means it is hoped to achieve a gradual reduction of the accumulated loss. Mr. A. P. G. Walters, chairman, states that if at a later date the necessity arose to sell such interests, they would expect to receive a higher price than is likely to be forthcoming at the present time. During the past year both operating companies made recovery, and results of the Britannic Electric Cable and Construction Co. during the current year have so far been satisfactory.

Revo Electric Co.

In order to reduce the disparity between the interim and final dividends it is proposed, in the absence of unforeseen circumstances, to declare an interim dividend of 10% in December, 1952, on account of the year to March 31, 1953, stated Mr. W. Leonard Barrows, chairman, at this meeting. The company has acquired the whole of the issued share capital of New Garter Foundry (1926) Ltd., which concern operates adjoining the Revo Works. The cost was £51,270, of which £5,133 has been written off. The results for the year show that the modernisation of the production plant and layout has brought satisfactory results. The modernised concrete lighting standards department is now in full production.

Ruston and Hornsby

The full account for the year to March 31 last lists group current assets at £10,789,448 (*£9,497,724*) of which stock in trade and work in progress account for £5,831,379 (*£5,060,177*). Current liabilities total £3,030,559 (*£2,386,575*). The directors point out that the company's general reserve now stands at £3,050,000. It includes balances previously shown separately, a stock and general contingencies reserve and pensions reserve. The directors are of the opinion there is no useful purpose in maintaining these separate reserves, and a general reserve is available for all purposes.

Sterling Cable Ltd.

For the year to March 31 last the group trading profit was £127,303 (*£102,331*). The dividend recommended is 10% (7½%) plus a bonus of 2½%. The net profit, before taxation, is £87,682 (*£72,749*), but taxation absorbs £76,051 (*£47,124*) and there is £15,559 (*£14,374*) carried forward.

Thorn Electrical Industries, Ltd.

Owing to the continued expansion of the business of the group, it is anticipated that further finance will be required up to a substantial figure within the next two years, the directors state. It may be more advantageous and practicable to raise further finance by the issue of loan capital rather than by the issue of further share capital and, therefore, in order to place the board in a position to meet such a situation it is desirable that the existing limits on their borrowing powers should be increased to £2 million, the statement adds. Details of the profit for the year to March 31, 1952, we noted last week. The turnover for the past year constituted a record, but while world conditions are not encouraging at the present time, Mr. J. Thorn, chairman, says the company faces the future with quiet confidence.

Dividends Declared

Automatic Telephone and Electric Co.—Interim Ordinary dividend of 3%.

Rheostatic Co.—Interim of 4% (*same*).

Electric Supply News . . .

Aberystwyth

Complaints from Aberystwyth town clerk about noise and vibration from the local power station (the generating capacity of which was recently increased) were dealt with at last week's meeting of the Merseyside and North Wales Electricity Consultative Committee. It was stated that the only complete solution of the problem was the development of the Rheidol hydro-electric scheme. The town clerk had complained about "apparent vibration" in the area immediately surrounding the station, and submitted that householders nearby were frequently unable to sleep at night. At the meeting it was stated that tests by B.E.A. research engineers confirmed earlier findings that though the Board could accept complaints of noise, there was no vibration from the station which could possibly damage buildings or cause any annoyance. As a short-term policy the Authority was now considering the possibility of closing the station between 1 a.m. and 6 a.m. and carrying the night load for the district from the Machynlleth and Towyn power stations. In the long term, the B.E.A. maintained that the most direct solution to the problem would be the development of the Rheidol hydro-electric scheme. This would enable Aberystwyth to be closed down as a base generating station, reserving it for peak and emergency operation. The divisional controller, Mr. W. A. Gallon, added that the Authority were pressing forward with the preliminaries for the Rheidol scheme, and he hoped that Aberystwyth would give the necessary support to its development at the appropriate time.

B.E.A. Supplies

In the month of July last, the total of units sold by the B.E.A. to all customers was 3,737 m., an increase of 1·9% on the corresponding month of 1951. Adjusted to normal weather and standard working days, this increase becomes 1·3%.

Individual area board purchases from the B.E.A., together with direct sales, are listed in the table below. Sales to mainly industrial areas in July were almost the same as last year. For mainly non-industrial, there was a 4·7% increase.

Board	July Total m. units	% Increase on July, 1951
London	320	1·6
South Eastern ...	198	7·0
Southern	231	7·9
South Western ...	116	8·4
Eastern	319	4·6
East Midlands ...	291	2·1
Midlands	395	2·9
South Wales ...	264	9·1
M. and N. Wales ...	232	−6·8
Yorkshire	403	4·7
North Eastern ...	243	−4·3
North Western ...	419	−6·3
S.E. Scotland ...	74	2·8
S.W. Scotland ...	172	2·4
Direct sales	60	+5·3
Grand total ...	3,737	+1·9

Hambledon

A proposal to erect a 33 kV overhead line from Dorking rural district, terminated at Thornsflush, Cranleigh, by a transformer station covering an area 117 ft by 110 ft, was reported to the Planning Committee of Hambledon Rural District Council recently. The committee resolved to raise the strongest possible protest against the proposed siting of the transformer station.

N. of Scotland

The Affric hydro-electric scheme of the North of Scotland Hydro-Electric Board is to be officially inaugurated by the Duke of Edinburgh on October 13.

Stratford-upon-Avon

At a public inquiry held by Mr. H. W. Grimmitt, of the Ministry of Fuel and Power, last week, a proposal by the Midland Electricity Board to carry overhead an 11 kV cable to provide electricity for two isolated cottages at Alveston was opposed by the town council. Mr. G. P. Wilson (for the Midland Electricity Board) said that it did not agree with the Town Council that an overhead cable from the Alveston substation to Cliff Cottage would interfere with the amenities. Trees would act as a screen. The cost of an overhead cable would be £689, compared with £1,415 for an underground cable. Mr. H. Spurr, construction engineer, of Worcester and district sub-area, told Mr. T. E. Lowth (town clerk) that the contribution from the applicant would be £380 and the balance, to be supplied by the Midland Electricity Board, was £309. The town clerk said his council desired to prevent encroachment of o.h. cables, pylons or poles in territory under its jurisdiction.

LIGHTING SCHEMES

Drogheda.—The Eire E.S.B. has submitted to the T.C. a plan for improved street lighting. The charge for renovation and additional lamps in the first year would be £2,475.

Dungannon.—The U.D.C. proposes to spend about £6,000 on extending public lighting.

Gosport.—Council is recommended to apply for sanction to provide lighting on A.32 at estimated cost of £6,570.

Leicester.—City Council recommended to apply for sanction to borrow £20,000 for street lighting on numerous estates.

Narborough (Leics).—Part conversion of street lamps from gas to electricity may be considered shortly. Complete scheme cannot be carried out at once.

Willingdon.—The parish council is considering installing street lighting at a cost of about £1,000. A public meeting is being held.

Commercial Information

CONTRACTS OPEN

HOME

Aug. 29.—N. of Scotland H.-E. Board. Tenders invited for multicore high- and low-voltage paper insulated cables. Particulars from Area Manager of Board, Dundee Area, Dudhope Crescent Rd., Dundee. (See August 14 issue.)

Aug. 30.—Spenborough U.D.C. Electrical work in 12 houses at Halifax Road, Windy Bank estate, Hightown, Liversedge. Architects, Howorth, Walker and Liley, Albion Chambers, Cleckheaton.

Aug. 30.—Basingstoke. Park Prewett Hospital Management Committee invites tenders for supply of electric lamps during six months beginning October 1. Secretary is Fredk. Hayes.

Aug. 30—Dearne (Yorks) U.D.C. Provision and erection of 19 concrete columns with 240 W fluorescent tubes and lanterns, etc., for street lighting in Barnsley Rd., Goldthorpe. Engineer and Surveyor, Council Offices, Bolton - upon - Dearne, near Rotherham.

Sept. 1.—Aspull (Lancs) U.D.C. Electrical wiring in 20 houses on site 11, Hilton scheme. Engineer and Surveyor, Council Offices.

Sept. 1.—Cookstown (Tyrone) U.D.C. Installation of electric light, etc., in 48 houses and 6 flats at Monrush. A. Montgomery, clerk, Council Offices, Molesworth Street.

Sept. 1.—Newcastle. Tyne Improvement Commission requires supply, laying and jointing of cables in connection with power supply to coal loading plant at Whitchill Point, North Shields. Secretary of Commission is J. K. McKendrick, Berwick St., Newcastle. Deposit £1 1s. (See August 14 issue.)

Sept. 1.—N. Ireland. Electrical work in 20 houses at Dungannon for N.I. Housing Trust. Trust is at 12 Hope St., Belfast. Deposit 10s.

Sept. 1.—Slough T.C. Provision of 100 concrete columns and lanterns with 80 W mercury lighting equipment and erection of 28 such units for Class B street lighting scheme. Borough Engineer, Town Hall. Deposit £1 1s.

Sept. 1.—West Riding. Renewal of electrical installation at "The Beeches," Tadcaster. Applications to County Architect, "Bishopgarth," Westfield Rd., Wakefield. Deposit £2 2s. (See August 7 issue.)

Sept. 2.—Lancashire County Fire Brigade. Supply of dry batteries and bulbs. Chief Officer, Hazelmere, Garstang Rd., Broughton, nr. Preston.

Sept. 2.—Windsor R.D.C. Internal wiring of 16 houses at Sunningdale, and 12 each at Sunninghill and Old Windsor. Building Surveyor, Council Offices, Bowden Rd., Sunninghill.

Sept. 3.—Cockermouth U.D.C. Supply and erection of (*a*) six concrete lighting columns with brackets, arms, lanterns, fluorescent tubes and control gear; (*b*) 24 concrete lighting columns with tungsten lighting fittings, control gear and wiring; and (*c*) four conversion units from gas to tungsten lighting, complete with control gear and wiring. M. M. Dixon, Surveyor, Town Hall, Cockermouth. Separate tenders for each of the works. Deposit £2 2s.

Sept. 3.—Greenwich B.C. Tenders invited for electric street lighting schemes under Contract No. 1: removal of 367 h.p. gas columns and adaptation and re-erection of 233 columns, and adaptation *in situ* of 141 columns; and under Contract No. 2: provision of bracket arms, lanterns, control gear and wiring to 374 columns and 2 suspended lanterns. Borough Engineer and Surveyor, Town Hall, S.E.10. Deposit £2 2s. (See July 24 issue.)

Sept. 3 — Newcastle-on-Tyne. Repair and maintenance of electric lighting on various estates for six months, beginning Oct. 1. Applications to City Architect, 18 Cloth Market, Newcastle.

Sept. 3.—Stepney B.C. Provision and installation of five electric passenger lifts in Cornwall St. housing scheme. Borough Engineer and Surveyor, Municipal Offices, 227/233 Commercial Rd., E.1.

Sept. 5.—Stourbridge T.C. Installation of 62 units of Class A street lighting with mercury lamps and concrete columns. G. N. Maynard, Borough Engineer and Surveyor, The Council House.

Sept. 6.—Ormskirk U.D.C. Supply of 63 concrete columns, lamps, lanterns and components for Group A and B street lighting. Surveyor, Council Offices, Burscough St. (See August 14 issue.)

Sept. 8.—Musselburgh. Erection of 15 lamp standards and installation of sodium lamps in Pinkie Rd. Burgh Surveyor, Municipal Offices, High Street.

Sept. 8.—Wymondham U.D.C. Supply and installation of 21 concrete columns, lanterns, etc., on London-Norwich Rd. and in conversion of street lighting from gas to electric. T. J. Turner, clerk, Council Offices. Deposit £2 2s. (See August 21 issue.)

Sept. 9.—Dover T.C. Supply and erection of 11 concrete columns and fixing of H.P.M.V. units and auxiliary equipment and complete wiring along Snargate St. Also supply of 11 sets of lanterns, 400W H.P.M.V. lamps, gear, time switches, all to Group A standard for same scheme. These are separate contracts. Borough Engineer, Brook House. Deposit £2 2s. in each case. (See August 21 issue.)

Sept. 10.—Edinburgh. Electrical installation in 185 houses at Clermiston. City Architect, City Chambers, Edinburgh 1.

Sept. 12.—Sheffield T.C. Electrical installations in 652 dwellings on the Hackenthorpe estate, in 54 dwellings on the Basegreen estate, and in 50 dwellings on the Birley estate. W. G. Davies, City Architect, Town Hall, Sheffield 1. Deposit £1.

Sept. 12.—Edinburgh. Lighting and power installations in 90 houses and 15 shops on Inch Housing Development. City Architect's Office, City Chambers.

Sept. 12.—Kendal T.C. Provision and installation of 72 mercury vapour lighting units and 7 fluorescent units, in Group A, including concrete columns and

auxiliary equipment, and wiring along Windermere Rd. Borough Engineer and Surveyor, Municipal Offices, Lowther Street. (See July 24 issue.)

Sept. 12.—Sheffield. Electrical installation in Hurlfield secondary school. W. Geo. Davies, City Architect, Town Hall. Deposit £2.

Sept. 13.—Consett (Dur.) U.D.C. Installation of electric lighting in 34 houses at Shotley Bridge. Applications to E. Simpkin, surveyor, Council Offices, Medomsley Rd., by above date.

Sept. 18.—Manchester T.C. Alterations and additions to electrical installation at Bostock Hall, near Northwick. City Architect, Town Hall, Manchester. Deposit £1 1s. (Advertised in this issue.)

Sept. 19.—Neston U.D.C. Supply and erection of 32 electric lighting columns, height 25 ft, for fluorescent and sodium lamps, together with all necessary control gear and fuses. Engineer and Surveyor, Town Hall, Neston. Deposit £1 1s.

Sept. 22.—Berwickshire C.C. Electrical work in 7 houses at Lower Burnmouth. County Surveyor, Duns.

Sept. 22.—Haverfordwest T.C. Installation of electric light and power in about 143 houses in scheme No. 2. Borough Surveyor, 9 Victoria Place. Deposit £2.

Sept. 26.—Glendale R.D.C. Supply of electric cookers for 43 houses. J. Baston, Clerk of the Council, Council Offices, Wooler.

Oct. 1.—Dalkeith T.C. Electrical work in 80 houses at Woodburn. Particulars from the surveyors, Morham and Brotchie, 29 Hanover St., Edinburgh.

No date stated.—Bristol. Electric batteries, lamps and general items included in list of supplies required by Southmead General Hospital. C. C. Hancock, secretary, Group Administrative Offices, Southmead Hospital, Bristol.

No date stated—Hendon T.C. Additional lighting points and electric lighting fittings, and reinstatement of defective wiring installation at Hendon County Grammar School, The Crest, Hendon. Applications to Borough Engineer and Surveyor, Town Hall, Hendon, N.W.4, by Sept. 8. Deposit £2 2s. (Advertised in this issue.)

No date stated.—N. of Scotland H.E. Board. Supply and erection of approximately 13 miles of 33 kV double-circuit woodpole overhead lines in Killin district, Perthshire. Merz and McLellan, 39 Northumberland St., Edinburgh 3. Deposit £2 2s. (See August 7 issue.)

OVERSEAS

*Details of items marked * may be obtained on application to the Board of Trade, Horseguards Avenue, S.W.1, quoting reference.*

Sept. 10.—South Africa. Supply of 17 electric welding outfits for use in 1 ton tracks. The tender is divided into two sections: (*a*) electric generator, and (*b*) power take-off. B.o.T. (Ref: CRE 28931/52).*

Sept. 10.—Uruguay. Supply of 16,000 kilos of bare or lightly covered iron wire electrodes for rail welding, in diameters of 4·877 mm; 4·064 mm. and 3·251 mm; for the Administracion Municipal de Transportes Colectivos. B.o.T. (Ref. CRE/28698/52)*.

Sept. 16.—Uruguay. Telephone trunk cables, mostly armoured lead covered, of 15,145 metres between central offices "Paso" and "Santiago Vazquez," and of 1,500 metres from there to the S.W. radio station, for Usinas Electricas y Telefonos del Estado. B.o.T. (Ref: CRE 28494/52).*

Sept. 22.—New Zealand. 500 MA generator and control desk to supply two rotating anode X-ray tubes, and a motor screening stand, for Auckland Hospital. B.o.T. (Ref. CRE/28917/52)*.

Sept. 25.—Uruguay. Supply of base copper conductors for Usinas Electricas y Telefonos del Estado: (a) 25,000 kilos wire 16 sq. mm. (b) 2,000 kilos of cable 16 sq. mm. of 19 wires, and (c) 10,000 kilos of cable of 35 sq. mm. of 19 wires. B.o.T. (Ref. CRE/28496/52)*.

Sept. 29.—Formosa. 150 carbon brushes 1·8 cm x 31 cm x 6·5 cm, for d.c. generator 160v; and 14 tons of graphite electrode, for the Central Trust of China. B.o.T. (Ref. CRE/29063/52)*.

Sept. 30.—Uruguay. (*a*) 190,000 white porcelain insulators 90 mm. high by 60 mm. dia.; (*b*) 66,000 iron support pins for above; (*c*) 200,000 porcelain insulators 100 mm. by 70 mm.; (*d*) 67,000 iron support pins; (*e*) 50,000 aerial circuit-breakers, test voltage 1,000 V, 50 cycles. B.o.T. (Ref: CRE 28495/52).*

Oct. 3.—Portuguese East Africa. Supply and installation of 3 passenger lifts, 1 baggage lift and 3 service lifts at Grand Hotel, Beira. B.o.T. (Ref. CRE 28730/52)*.

Oct. 9.—New Zealand. Supply of circuit-breakers and switches of various types for the Post and Telegraph Department. B.o.T. (Ref. CRC/29001/52)*.

Your Queries — Answered

"Chapman-Parker" luminous buttons for switches, makers of? N.E.—Chapman-Parker, 276 Mitcham Rd., S.W.17. (23743)

Ball bearing pullers, makers of? S.B.—Atlex Mfg. Co., Ltd., 258 Langham Rd., N.15; J. W. Pickavant and Co., Ltd., Frederick St., Birmingham 1; Jenks Bros., Ltd., Britool Works, Bushbury, Wolverhampton. (23752)

"Collace" coffee grinders, makers of? T.B.—A. M. Collins and Co., 60 Victoria Rd., Surbiton. (23758)

"Efteelite" lighting fittings, makers of? L.B.—Fredk. Thomas and Co., Everton Buildings, Stanhope St., N.W.1. (23769)

"Edwards" combined compressor and vacuum pumps, makers of? J.S.—W. Edwards and Co. (London), Ltd., Worseley Bridge Rd., S.E.26. (23762)

"Sauter" time switches, agents for? T.E.—Nathan and Allen Ltd., 131 Victoria St., S.W.1. (23766)

"Atlas" kettles, makers of? E.M.—Williams (Birmingham), Ltd., Westwood Rd., Birmingham 6. (23774)

"Miele" hydro extractors, agents for? S.T.—B. and J. Sippel Ltd., 175 Lauderdale Mansions, London, W.9. (23779)

The above are selected from questions we have answered this week. If you have a query, send it to us.

Contracts Open—continued.

Nov. 18.—New Zealand. 159-220 kV single-circuit galvanised steel transmission line towers for the Bunnythorpe-Haywards 220 kV line, for the State Hydro-Electric Department. Towers will comprise 123 standard suspension, 5 heavy, and 31 angle towers, all may be either of wedge or waisted formation. Specifications and plans available for perusal at N.Z. Government Office in London. Deposit £100.

No date stated.—Uganda. Electricity Board invites tenders for supply and erection of eight single-phase 10 MVA transformer units at Owen Falls power station and at Tororo; also two earthing transformers at latter site. Documents from Board's offices at 129 Grand Bldgs., Trafalgar Sq., London S.W.1. Deposit £2 2s. (See August 14 issue.)

CONTRACTS PLACED

Blackpool. Recommended by Highways Committee: 200 25-ft concrete lighting columns and 500 15-ft columns, Stanton Ironworks Ltd., £4,000 and £4,650 respectively; 200 group A side entry lanterns, £2,150, and 500 group B lanterns for h.p.m.v., £1,950, General Electric Co.; and 200 400-W chokes and 15 mfd capacitors, £1,200, and 500 125-W chokes and 10 mfd capacitors, £2,350, Alfred Williams and Sons.

Haslingden T.C. Rewiring of Municipal Offices, R. A. Ranson.

Kendal T.C. Electrical installation in 78 dwellings at Hall Garth, R. Hadwin and Son, £2,776.

Manchester. Provision of lift at Monsall Hospital, G. W. Dawson and Co., £6,820.

Northwich U.D.C. Electrical installation in 100 houses on Leftwich estate, Gorst E. Oakes, £1,916.

Stockport T.C. Electrical installations in 34 houses at Nelstrop Road, Ingram and Ashton Ltd., £1,614.

Wandsworth B.C. Supply of eight electrical street cleaning trucks. S. Hole's Electric Vehicles Ltd., £3,295.

Wanstead and Woodford T.C. Installation of first stage of group B street lighting, North Midlands Engineering Co. Ltd., £8,201.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	285 0 0	—
LEAD, good soft pig (foreign)	131 0 0	£128 0 0
,, ,, ,, "English" quality	132 10 0	
Tin (99—99.76%) ...(Cash)	964½-965	—
,, (3 months)	945-945½	—
ALUMINIUM, commercial purity (del.)	157 0 0	—
ZINC	122 0 0	112 0 0
ARMOURING:		
Galv. Steel Wire (0.104 in.)	54 0 0	—
Mild Steel Tape (0.04 in.)	39 15 0	—

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Air Conditioning and Engineering Ltd. Resolution for voluntary winding-up passed at meeting on August 8. Mr. E. H. Orford, 26-28 Hallam Street, Portland Place, W.1, appointed liquidator.

Central London Electricity Accessories Ltd. General meeting at 46 New Broad Street, E.C.2, on September 25 at 10.30 a.m. to receive report of Mr. H. J. Mellons, liquidator, on winding-up.

N. H. Donkin Ltd. Resolution for voluntary winding-up passed at meeting on August 19. Mr. R. B. Smith, York House, Alfred Street, Leeds, appointed liquidator.

Electrical and Associated Services (Mumbles) Ltd. Meetings of members and creditors at 20 Walter Road, Swansea, on September 17 at 11 a.m. and 11.30 respectively, to receive report of Mr. B. Baddiel, liquidator, on winding-up.

Gamma Electronics Ltd. Meetings of creditors and contributories today, August 28, at Room 401, Inveresk House, 346 Strand, W.C.2, at 2.30 p.m. and 3 p.m. respectively.

James Bros. (Wiltshire) Ltd., electrical engineers and dealers, The Parade, Trowbridge. Mr. J. E. Scheerer, 7 Bond Place, Leeds, appointed liquidator at meeting on August 11.

Labgear Ltd. Meeting of members at 10 Jesus Lane, Cambridge, on September 20 at 10 a.m. to receive report of Mr. N. A. Chater, liquidator, on winding-up.

Wembley Electrical Appliances Ltd. In connection with an intended dividend, proofs should be sent to Mr. E. T. Wood, liquidator, 27 Old Bond Street, W.1, by September 5.

Partnership Dissolved

Twickenham. Aubrey Edward William Jacob, Kenneth Victor Lockyer, and Edgar John Arthur Brooks, trading as Southern Electric Motors, at Twickenham. Dissolved so far as concerns E. J. A. Brooks. All matters dealt with by A. E. W. Jacob and K. V. Lockyer, who are continuing the business.

BANKRUPTCY ACTS

Applications for Discharge

Croydon. Robertson, James, electrical engineer, 68 Arran Road, Catford. Discharged subject to payment of £50.

St. Albans. Coles, Allan James, electrical engineer and contractor, lately of 2a Pinner Road, Harrow. Discharge granted subject to payment of £51 10s.

Release of Trustee

Warwick. Bateman, Dennis Noon, lately trading as Villiers Electric at 1 North Villiers Street, Leamington. Trustee, R. K. Clark, 37 Temple Street, Birmingham. Release date, August 18, 1952.

Intended Dividends

Lincoln and Horncastle. Parker, John Leslie, electrician, 15 West Street, Horncastle. Last day for receiving proofs, September 5. Trustee, Mr. E. C. Stimpson, 22 Regent Street, Park Row, Nottingham.

Sheffield. Ruff, Hubert Lewis, electrical engineer, 141 Abbeydale Road, Sheffield. First and final dividend of 20s. in £ plus 4% interest payable on August 26 at Official Receiver's Office, 55 Queen Street, Sheffield.

BUSINESS PROSPECTS

HOME

Adwick. U.D.C. to build 220 houses at a cost of £322,061. Plans by Council's Architect, Adwick, Doncaster.

Barking T.C. has approved plans for the erection of a factory at Thames Road, for the West Bank Rubber Co.

Basingstoke T.C. Erection of 20 dwellings at South Ham housing site. Borough surveyor, Municipal Buildings.

Beckenham. The Kent Education Committee has approved the adaptation and extension of Inglewood, Durham Avenue, at an estimated cost of £20,000.

Bolton T.C. is recommended to approve plans for drying kilns, storage and loading accommodation at Edgefold, Plodder Lane, for Jacksons (Edgefold), Ltd.

Bournemouth T.C. Erection of 30 houses and 8 bungalows at Kinson estate. Borough Architect, Room 106, Town Hall.

Carlisle. The plan for the erection of new workshops at Carlisle for the Cumberland and Westmorland Home and Workshops for the Blind is out to tender. Architects are Johnston and Wright, 13 Castle St., Carlisle.

Castle Donington R.D.C. Erection of 16 houses at Garden Row, Kegworth. Architects, McCarthy, Collings and Co., 187 Forest Road, Coalville.

Devizes T.C. Erection of 38 houses at Home Farm housing estate. Town Clerk, Midland Bank Chambers.

Durham C.C. Construction of a granary and food-mixing store at Houghall Farm. G. R. Clayton, county architect, Court Lane, Durham.

Falkirk. The Dean of Guild Court has approved plans for the re-erection of premises at Vicar Street and Garrison Place, for J. Gartmore and Sons, Ltd., Maxwell Place, at an estimated cost of £6,500.

Hambledon R.D.C. Erection of 20 houses at Cranleigh village estate; 8 houses, 2 bungalows and 12 flats at Woodside Rd., Chiddingfold, and 14 houses and 12 flats at Croft Rd., Witley. Engineer and Surveyor, Council Offices, Bury Fields, Guildford.

Hemel Hempstead. Development Corporation to erect a community centre at Adeyfield at a cost of about £20,000.

Ipswich T.C. Erection of 20 bungalows at Whitton Church Lane. Borough Engineer and Surveyor, 19 Tower Street.

Leeds. The Regional Hospital Board is inviting tenders for the erection of a 3-storey public health laboratory, of 160,000 cu. ft, at Seacroft Hospital, York Road, Leeds. Architect to the Board, Park Parade, Harrogate.

Leyton B.C. Erection of 18 flats at Grange Park Road. Borough Engineer and Surveyor, Town Hall.

Littlehampton U.D.C. Erection of 32 houses and flats at Wickbourne. Engineer and Surveyor, Council Offices.

Liverpool. For Regional Hospital Board, erection of an X-ray department at Sefton General Hospital. Regional Architect, 88 Church Street, Liverpool.

Liverpool T.C. Erection of 24 flats at Bidder Street, Everton, and 6 flats at Norwood Grove. City Architect and Director of Housing, Blackburn Chambers, Dale Street, Kingsway, Liverpool.

Margate T.C. Erection of 36 flats at Upper High Street. W. L. Armstrong, borough engineer, 38 Grosvenor Place, Margate.

Middlesbrough. The T.C. is to place contracts for the erection of another group of 112 houses on the Park End site. The Borough Engineer is J. A. Kenyon, Municipal Buildings, Middlesbrough. The Newcastle Regional Hospital Board, "Dunira," Osborne Road, Newcastle-on-Tyne, are considering the provision of casualty department and dispensary at North Ormesby Hospital. The architects are Garbutt, Archibald and Archibald, 23 Albert Road, Middlesbrough. The scheme, however, is not being proceeded with immediately.

Middlesex. The C.C. has approved the erection of the first instalment of a secondary modern school at Harefield. Estimated cost £73,790.

Morley T.C. recommended to approve plans for the extension of a factory at Hope Street, for Greenwood and Walsh, Ltd., Peel Street Mills.

Northfleet U.D.C. (Kent). Erection of a block of 22 flats at Coldharbour Road Estate. Engineer and Surveyor, Council Offices.

Northumberland. Pithead baths are proposed at East Hartford Colliery to plans by J. S. Spooner, N.C.B. Architect, Ashfield Tower, Newcastle-on-Tyne.

Osgoldcross R.D.C. Erection of 16 houses at Fairburn. Architects, Tennant and Smith, Ropergate, Pontefract.

Overton R.D.C. Erection of 19 houses at Poethlyn Terrace. Architects, H. A. Clark, F. C. Roberts and Partners, 41 Regent Street, Wrexham.

Rugeley U.D.C. Erection of 56 houses at St. Michael's site fronting Redbrook Lane. E. J. James, engineer and surveyor, Council House.

Saltburn (Yorks). C. D. Taylor, U.D.C. Architect, 41 Baxtergate, Whitby, has prepared plans for the erection of 26 houses on the Marske Road Estate and tenders are being obtained.

Selby U.D.C. Erection of 42 houses at Stainer Wood estate. Architects, Blenkinsopp and Thompson, Clifton Chambers, Park Street, Selby.

Stanley (Co. Durham). T. Barrett, Sons and Partners, 127 New Bridge Street, Newcastle-on-Tyne, have been appointed quantity surveyors for the proposed conversion of laundry into outpatients' department at the Holmside and Southmoor Hospital for Newcastle Regional Hospital Board.

Stockport T.C. Recommended to approve plans for a single storey office building at King Street West, for Bennett and Hamer (Engineers), Ltd.

Stoke-on-Trent T.C. Recommended to approve plans for extensions to factory in Ogden Rd., Hanley, for Woods Tileries (Hanley), Ltd.

Thorne R.D.C. Erection of 56 houses at South Common estate. Architects, T. H. Johnson and Son, 20 Priory Place, Doncaster.

Tottenham B.C. At Tewkesbury estate: erection of ten 3-bedroom flats, 20 2-bedroom flats and 21 1-bedroom flats. Borough Engineer and Surveyor, Town Hall.

OVERSEAS

Cuba. Senor Orlando Quinones de Sol, Belascoain 512, Altos, Havana, is interested in buying U.K. electric irons, both automatic and non-automatic. B.o.T. (Ref. CRE 24697/52).*

NEW COMPANIES

Extracted from the Register issued by Jordon and Sons, Ltd., 116 Chancery Lane, London, W.C.2.

Arderson Construction Co. and Gibson Ltd., Clifton House, Euston Rd., N.W.1. Manufacturers, contractors, fitters and dealers in relation to the production, application and installation of thermal and acoustic insulation, external and internal roofing and roof lining, etc. Cap: £20,000. Dirs.: R. L. Spooner, and W. Gibson.

CEMA Electrics Ltd., 32 Portland Av., N.16. To carry on business of electrical, mechanical, radio and television engineers and contractors, etc. Cap.: £3,000. Dirs.: A. A. Silberstein and M. Goldstein.

Harry Davis Company (Kidderminster) Ltd., 4 Lion St., Kidderminster, Worcs. To take over business of electrical consultants and contractors carried on as "The Harry Davis Company" at Kidderminster. Cap: £1,000. Dirs.: H. Davis (permanent director and chairman) and C. Davis.

Electrical Thermometer Co. Ltd., 1 Stroud Green Rd., Finsbury Park, N.4. Cap.: £100. Dirs.: R. S. Evenden and W. F. Cook.

W. H. Gatley and Co. Ltd., Water St., Todmorden. To carry on business of electrical engineers, etc. Cap.: £1,000. Dirs.: J. B. Gatley and Mrs. D. Gatley.

Jaymac (Engineering) Ltd., 203 Lower Clapton Rd., E.5. To carry on business of general and electrical engineers, specialists in the manufacture of insulating materials, etc. Cap.: £500. Dirs.: J. W. A. McDermott and Doris McDermott.

Phidelity Manufacturing Co. Ltd. 29/31 Euston Rd., N.W.1. Manufacturers of and dealers in electrical, mechanical, cinematographic, photographic, wireless, and television and radio apparatus and equipment, cameras, etc. Cap.: £2,000. Dir.: L. E. Pinches, J. H. Pinches and K. G. Gould.

F. H. Wheeler (Newcastle) Ltd. To carry on business of electrical contractors and engineers, etc. Cap.: £1,000. Dirs.: F. H. Wheeler, 55 Park Lane, W.1. F. Harrington, 96 Morthen Rd., Wickersley, nr. Rotherham, and A. J. K. Parker, Westways, Harefield Rd., Uxbridge.

TRADE NOTES

Agency. Truvox Ltd. announce that Mr. Norman Wilson, of B. and H. (Nottm.) Ltd., Popham Street, Nottingham, has been appointed agent for Truvox appliances and Truvox and Rola-Celestion loudspeakers for sale to the wholesale trade. Mr. Wilson's territory covers Leicestershire, Northamptonshire and Rutland.

Beama Contract Price Adjustment Formulae. *For Electrical Machinery and Equipment.* For purposes of calculating variations in : (*a*) "Rates of Pay"—the rate of pay for adult male labour at August 16, 1952, shall be deemed to be 134s. (*b*) "Cost of Material"—the index figure for Materials used in the Electrical Machinery Industry published in the Board of Trade Journal on August 16, 1952, is 170.7

For Turbo-Generating and Allied Plant. For purposes of calculating variations in : (*a*) "Rates of Pay"—the rate of pay for adult male labour at August 16, 1952, shall be deemed to be 134s. (*b*) "Cost of Material"—the index figures published in the Board of Trade Journal on August 16, 1952, are: Materials used in Mechanical Engineering Industries—152.8. "Blast Furnaces and Iron and Steel Melting and Rolling (40 and 41)"—142.6. The price of brass condenser tubes ¾ in. o/d, 18 SWG, published in The Metal Bulletin on August 22, 1952, is 3s. 9¾d.

For Outstanding Contracts covered by the B.o.T. Intermediate Products Index. For purposes of calculating variations in: (*a*) "Rates of Pay"—the rate of pay for adult male labour at August 16, 1952, shall be deemed to be 134s. (*b*) "Cost of Material"—the index figure for Intermediate Products published in the Board of Trade Journal on August 16, 1952, is 363.9.

Extensions. Small Electric Motors Ltd. have recently carried out extensions to their Eagle Works at Churchfields Road, Beckenham, and have, in addition, taken over and equipped St. John's Works, Green Lane, Penge, for the manufacture of their range of standard commercial motors.

Jordan Restrictions. For a number of commodities which have been classified as non-essential, import licences are no longer being issued or foreign exchange made available. The list of goods includes refrigerators (except spare parts), radio sets (except spares) and electric fans. Importers of these goods must now obtain their foreign exchange from unofficial sources and must pay a "fine" of 25% on arrival of the goods in Jordan if from a hard-currency area. Goods from soft-currency areas are liable to a 15% fine.

Sales Tax. In Australia the sales tax on radio receivers has been reduced from 33⅓% to 20%.

MEETINGS TO NOTE

MONDAY, SEPT. 1

A.S.E.E. (Leeds branch).—"Application of Aluminium in the Construction of Cables." J. W. Fall and J. W. Robertshaw. Gt. Northern Hotel, Leeds, 7.30 p.m.

A.S.E.E. (N.E. London branch).—"The Work of the Association." G. Davidson. Angel Hotel, Ilford, 8 p.m.

TUESDAY, SEPT. 2

ELECTRONICS SYMPOSIUM AND EXHIBITION organised by Scientific Instrument Manufacturers' Assoc. opens at Examination Hall, Queen Sq., London W.C.1, and continues until Sept. 5.

INCORP. PLANT ENGRS. (London).—"Care and Maintenance of Lifts." J. H. H. Weeks. Royal Soc. of Arts, 7 p.m.

A.S.E.E. (W. London branch).—"The Isolation of Vibration and Noise from Electrical and Mechanical Machinery." R. B. Grey. Windsor Castle Hotel, 134 King Street, Hammersmith, W. 7.30 p.m.

WEDNESDAY, SEPT. 3

INCORP. PLANT ENGRS. (Southampton branch).—"Modern Lubrication Practice." R. S. Bassett. Polygon Hotel, 7.30 p.m.

A.S.E.E. (N. London Branch).—"Air Conditioning and Modern Methods of Insulating Buildings." A. C. Mackadam. Three Jolly Butchers Hotel, Wood Green, 8.15 p.m.

THURSDAY, SEPT. 4

A.S.E.E. (S. London branch).—"Oil Burners and Panel Heating." E. H. Bailey. Cafe Royal, North End, Croydon, 8 p.m.

FRIDAY, SEPT. 5

A.S.E.E. (Crewe branch).—"Ethical Implications of Science," J. Levitt. Crewe Arms Hotel, 7.30 p.m.

A.S.E.E. (Liverpool branch).—Chairman's address, L. Harper. Liverpool Engineering Society, 9 The Temple, Dale Street, Liverpool, 7.30 p.m.

Cartridge Fuse-links

PLEASE WRITE FOR CATALOGUE 30

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON E.C.1

WESTON
Electrical Measuring Instruments

No. 2 Sub-standard Instruments

The Weston Series of Portable sub-standard instruments covers a wide range of applications, including precision measurements in the laboratory . . . meter standardisation . . . transfer standards between D/C and A/C circuits . . . field measurements, acceptance tests, etc. They are available as Wattmeters, Voltmeters, Ammeters and Milliammeters in a variety of ranges and all embody 6″ scales, magnetic shielding and spring-loaded jewels. Full details of these instruments, also Weston switchboard, panel, first grade and laboratory standard instruments will gladly be supplied on request.

SANGAMO WESTON LIMITED

Enfield, Middlesex. Tel: Enfield 3434 (6 lines) & 1242 (4 lines). Grams: Sanwest, Enfield

Branches: Glasgow, Manchester, Newcastle-on-Tyne, Leeds, Liverpool, Wolverhampton, Nottingham, Bristol, Southampton & Brighton

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED • FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

CITY OF MANCHESTER

THE EDUCATION COMMITTEE invite tenders for ALTERATIONS and ADDITIONS to electrical installation at Bostock Hall, near Northwich, Ches. Specification and drawings may be obtained from the City Architect, Town Hall. Deposit £1 1s. (returnable). Tenders, sealed in endorsed envelopes, must be delivered before 10 a.m., September 18, 1952.

PHILIP B. DINGLE,
Town Clerk.

August, 1952. (A 685)

BOROUGH OF HENDON

HENDON COUNTY GRAMMAR SCHOOL
The Crest, Hendon, N.W.4.

THE BOROUGH COUNCIL invites tenders for the INSTALLATION of additional lighting points and electrical lighting fittings and REINSTATEMENT of defective wiring installation at the above school.

The form of tender, specification and bills of quantities will be issued by, and Plans Nos. B.1006/O.C.01718 and B.1007/O.C.01719 may be inspected at the offices of, the Borough Engineer and Surveyor.

Application for the documents must be made to the Borough Engineer and Surveyor not later than the first post on Monday, September 8, 1952, accompanied by a deposit of £2 2s, which will be returned on receipt of a bona fide tender on the form provided, and not subsequently withdrawn.

In the case of the accepted tender the deposit will be returned on the execution, when required, of the contract and bond; failing such execution as aforesaid the deposit will be forfeited.

The documents will be forwarded to the applicants as soon as possible after the first post on Monday, September 8, 1952, and must be returned on or before the date given on the form of tender in the envelope provided (suitably endorsed), which shall not bear any name or mark indicating the sender. Tenders received after this date and time will not receive consideration.

The Corporation does not bind itself to accept the lowest or any tender.

Dated August 21, 1952.

LEONARD WORDEN
Town Clerk.

Town Hall,
Hendon, N.W.4. (A 686)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY NO. 780.—SHIFT CHARGE ENGINEER, Agecroft H.P. Generating Station. Salary £704 to £733 (N.J.B. G.7). Apply to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before September 6. (A 699)

MIDLANDS ELECTRICITY BOARD

BIRMINGHAM and District Sub-Area require a DEPUTY SUB-AREA ENGINEER. Extensive experience required in the administration of a large engineering department, together with knowledge of the design of H.V. and L.V. networks, and operation and maintenance of switchgear, cables and protective systems. Should be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications. Salary £1,382 to £1,427 (N.J.B., Grade N.3) superannuable.

Apply within 14 days, stating age, experience, salary and position to Emil Braathen, Midlands Electricity Board, 14 Dale End, Birmingham, 4.

A. STEPHENS,
Secretary.
(A 691)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following superannuable position. Salary and conditions of service will be in accordance with the National Joint Board Agreement:

JUNIOR ENGINEER
Luton Generating Station

Salary N.J.B., Class "E," Grade 15—Grade 14, depending on qualifications and experience, at present £375 per annum with an increase to £413 per annum after 12 months and thereafter bi-annual increases to £426 per annum.

Duties include the operation and control of a.c. and d.c. plant on shift.

Experience in the technical operation of electrical, boiler house, and turbine house plant, is also provided and furnishes a suitable basis for promotion to higher technical grades.

Applicants should preferably have reached the standard of the Ordinary National Certificate or its equivalent. Previous experience with rotary converting plant and/or in a generating station will be an advantage.

Applications, stating age, details of qualifications and experience, should be addressed to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than September 6, 1952.

W. N. C. CLINCH,
Controller.
(A 698)

CROWN AGENTS FOR THE COLONIES

SHIFT CHARGE ENGINEER required for Central Electrification Scheme in Cyprus for 2 tours each of 2 years in first instance, with option of receiving gratuity on satisfactory completion of final service at the rate of £25 for each period of 3 months or becoming a contributor to a superannuation fund. Salary according to age and experience in scale £858 rising to £990 a year (including cost of living allowance). Free quarters and passages. Liberal leave on full salary. Candidates, under 45 years, must have served an apprenticeship to mechanical engineering and have considerable experience in the operation of a modern generating station. Preference will be given to candidates who are Corporate or Graduate members of the Institution of Electrical Engineers and/or the Institution of Mechanical Engineers, or who hold equivalent qualifications.

Apply at once by letter, stating age, full names in block letters and full particulars of qualifications and experience and mentioning this paper to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting on letter M.28674.B. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration.
(A 687)

LONDON ELECTRICITY BOARD

ASSISTANT COMMERCIAL ENGINEER

APPLICATIONS are invited for the above position in the Hampstead District of the North Western Sub-Area.

The successful applicant will be required to assist the District Commercial Engineer with the commercial organisation and development of the district.

Applicants should have had a good education, be of good address and have had practical experience in consumer services; commercial development of electricity supply (including experience in the operation of an electrical contracting and maintenance section), and control of Service Centres, sales and staff (including experience in the administration and operation of hire and hire-purchase schemes).

Pending grading of the post under the national agreement of the appropriate negotiating body, the provisional salary will be £650 per annum inclusive.

Application forms obtainable from Establishments Officer, 46 New Broad St., E.C.2, to be returned duly completed by September 6, 1952. Please enclose addressed foolscap envelope and quote ref. V 1473 T on all correspondence. (A 693)

SOUTH WEST SCOTLAND ELECTRICITY BOARD

Glasgow Sub-Area

APPLICATIONS are invited for the position of DEMONSTRATOR (female) in the Glasgow Sub-Area.

Applicants should possess recognised diplomas or certificates in domestic science and also the E.A.W. Certificate, and must be capable of giving lectures and demonstrations and of advising consumers in the use of electrical equipment.

The conditions of employment will be those of the Agreement of the National Joint Council (Administrative and Clerical Grades) and the salary will be in accordance with that agreement, viz., Grade 1, £360 to £450 per annum.

Applications should be made on the official form which may be obtained from the undersigned and which should be completed and returned not later than September 12, 1952.

JOHN CAIRNS,
Secretary.

75 Waterloo Street,
Glasgow C.2. (A 681)

SOUTHERN ELECTRICITY BOARD

ASSISTANT ENGINEER (MAINS/MAINTENANCE)

ISLE OF WIGHT District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B., Class "E," Grade 10, Column 1 (£535 per annum), N.J.B. Conditions of Service.

Applicants should have had experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems and should possess suitable technical qualifications. The successful candidate will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth and returned to him in envelope suitably endorsed not later than September 8, 1952.

F. W. KEMPTON,
Secretary.

August 28, 1952. (A 700)

BRITISH ELECTRICITY AUTHORITY

DIRECTOR OF WELFARE

APPLICATIONS are invited for the appointment o Director of Welfare to the British Electricity Authority. The appointment is superannuable and will be at a salary of £2,500 p.a.

The person appointed will be responsible for the direction and co-ordination of welfare, training and education, safety, health, and the machinery for joint consultation within the industry.

Applications, stating age, present appointment and salary, and giving full particulars of qualifications and experience, together with the names and addresses of two referees, should be addressed to Ernest Long, Secretary, British Electricity Authority, British Electricity House, Great Portland Street, London, W.1, to reach him not later than September 12, 1952, endorsed "Director of Welfare." (A 690)

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY No. 777, SHIFT CHARGE ENGINEER, Accrington Generating Station. Salary £613 to £623 (N.J.B., D.7).

Apply, quoting vacancy number, to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before September 6. (A 679)

CITY COUNCIL OF SINGAPORE

Electricity Department

APPLICATIONS are invited from suitably experienced and qualified engineers for the following vacancies on the staff of the new Singapore power station. Posts are permanent establishment, appointment on three years' agreement in first instance.

Appointment	Minimum Age	Approx. initial total salary and allowances £ p.a.
CONTROL ENGINEERS	26	2,037
COMBUSTION ENGINEER	28	2,037
ASST. MAINTENANCE ENGINEER (Electrical)	25	1,874
BOILER HOUSE SHIFT ENGINEERS	24	1,618

Salaries payable in Malayan Dollars $1 = 2s. 4d. The above figures of initial total salary and allowances include the basic salary and current variable Expatriation and Cost of Living Allowances. The C.o.L.A. used for calculation is that applicable to a married man with one or more dependent children.

Applications in duplicate with full details of qualifications, experience and personal circumstances to Messrs. Peirce and Williams, 1, Victoria Street, London, S.W.1, as soon as possible. (A 659)

HEREFORDSHIRE EDUCATION COMMITTEE

COLLEGE OF FURTHER EDUCATION

APPLICATIONS are invited for appointment as ASSISTANT LECTURER, Grade "A," to take electrical subjects in Ordinary National Certificate and City and Guilds Electrical Installation Courses, to take up duties as soon as possible.

Candidates should possess a degree or equivalent qualification. Candidates who have attended a Technical Teachers' Training College and/or have had industrial experience are preferred.

Forms of application, together with further particulars, may be obtained from the undersigned on receipt of a stamped addressed foolscap envelope, and should be returned as soon as possible.

A. P. WHITEHEAD,
Director of Education.

County Offices,
Hereford. (A 688)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

JUNIOR ENGINEER required at Walsall Generating Station. N.J.B. service conditions, superannuable appointment, salary in accordance with Schedule "A." Grades G 16 to 14, £375 to £471 per annum.

Ordinary National Certificate or an equivalent qualification required and preferably experience in a large generating station. Duties consist mainly of switchboard operation.

Application forms available from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, to be completed and returned by September 13, 1952.

F. W. LAWTON,
Divisional Controller.
(A 677)

SOUTH EASTERN ELECTRICITY BOARD

GENERAL ASSISTANT DISTRICT ENGINEER
Swale District

SALARY £443 to £457 p.a. under N.J.B. D.12. Superannuable. Applicants should be qualified and have experience in all types of rural and urban distribution work up to 11 kV. A knowledge of d.c. networks including the maintenance of rectifier sub-stations, together with d.c. a.c. changeover work, an advantage.

Applications, giving 2 referees, must reach F. E. Fairbank, A.I.E.E., Swale Manager, SEEBoard, 8Fa High Street, Sittingbourne, Kent, through an employment exchange, by September 11, 1952.

A. L. BURNELL,
Secretary.

August, 1952. (A 695)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

CROYDON "B" GENERATING STATION, SHIFT CHARGE ENGINEER. Applicants should have had suitable technical training together with experience in the operation of modern high-pressure turbine and boiler plant, E.H.T. switchgear and in the administration and control of labour. Preference will be given to those with P.F. experience. N.J.B. conditions of service and salary, Class "J," Grade 7, £831 12s. per annum including London allowance. Applications on forms obtainable from Station Superintendent, Croydon "B" Power Station, Beddington Farm Lane, Purley Way, Croydon, Surrey, to arrive by September 9, 1952. (A 692)

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF
THIRD ASSISTANT ENGINEER (SUBSTATIONS)
Construction Section, Chief Engineer's Department, Area Board Headquarters, Manchester

APPLICANTS should have had experience in the handling of switchgear, transformers and other substation equipment contracts, including the examination of tenders and the checking of drawings and diagrams, together with experience in the design and layout of substations, both indoor and outdoor, up to and including 33 kV equipment. Preference will be given to candidates who possess an engineering degree or the Higher National Certificate in electrical engineering.

Salary scale, £629-£858 p.a. Grade AX/EX 5. N.J.B. conditions.

APPOINTMENT OF
THIRD ASSISTANT ENGINEER, PURCHASING SECTION
Chief Engineer's Department, Area Board Headquarters, Manchester

The engineer appointed will be responsible to the purchasing officer for the preparation of contract documents, works progressing and conducting purchasing negotiations with suppliers. Preference given to applicants with works and contract department experience in firms manufacturing plant for the electricity supply industry. Corporate or graduate membership of the Institution of Electrical Engineers or exempting qualifications will be an advantage.

Salary scale, £629-£858 p.a. Grade AX/EX 5. N.J.B. conditions.

Applications for the above posts to Establishment Officer, The North Western Electricity Board, Cheetwood Road, Manchester 8, by September 6, 1952.

APPOINTMENT OF
(a) GENERAL ASSISTANT ENGINEER
(b) JUNIOR ENGINEER
(c) ASSISTANT (TARIFFS RECORDS)
Sub-area Consumers' Engineer's Department, Town Hall, Manchester

The duties of (a) and (b) will be to deal with industrial and commercial applications for electricity supply, consumers' complaints and general development of power sales. Possession of H.N.C. (or certificates leading to A.M.I.E.E.) will be an advantage. In (c) the duties will include estimates of revenue, comparisons of tariffs, analysis of charges, investigation of consumers' accounts, maintenance and analysis of large power consumers' records, statistical reports and commercial sales and development matters. Previous experience of industrial consumers' accounts and supply authority statistics or surveys is desirable.

Salary scales: (a) £641-£661 p.a., Grade M.13, N.J.B. conditions; (b) £395-£527 p.a., Grades M.20-17, N.J.B. conditions; (c) £440-£500 p.a., Grade 2, N.J.C. conditions.

Applications to Sub-area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, by September 6, 1952.

APPOINTMENT OF
GENERAL ASSISTANT ENGINEER
(TECHNICAL ASSISTANT)
For System Planning and Development, No. 2 Sub-Area Headquarters, Manchester

Candidates should have had a sound training in electrical engineering and be competent to assist in the preparation of schemes and estimates for extensions to the h.v. and l.v. systems up to 33 kV, and in the design and layout of sub-stations. Preference given to candidates with experience of protective gear systems and an aptitude for system calculations.

Salary scale, £641-£661 p.a. Grade M.13. N.J.B. conditions.

APPOINTMENT OF
FIRST ASSISTANT DISTRICT ENGINEER
2D (Leigh) District

Candidates should have had a sound training in electrical engineering and be competent to assist the district engineer in all work in connection with the district organisation, including construction, maintenance and operation work on sub-stations, overhead and underground h.v. and l.v. mains. Preparation of estimates and reports. Corporate membership of the I.E.E. will be an advantage.

Salary scale, £825-£862 p.a. Grade F.4. N.J.B. conditions.

Applications for the above posts to Sub-Area Manager, No. 2 Sub-Area, The North Western Electricity Board, National Buildings, St. Mary's Parsonage, Manchester 3, by September 6, 1952.

APPOINTMENT OF SENIOR ASSISTANT ENGINEER
(MAINS, PLANNING AND CONSTRUCTION)
Sub-Area Headquarters, Blackburn

Corporate members of the I.E.E. who have had extensive experience in design, construction and operation of substations, overhead line and underground cable networks at voltages up to and including 33 kV preferred.

Salary scale, £1,001-£1,046 p.a. Grade J.4. N.J.B. conditions.

(Continued in next column)

(Continued from previous column)

Applications, stating age, qualifications and experience, present post and salary, to Sub-Area Manager, No. 5 Sub-Area, The North Western Electricity Board, Jubilee Street, Blackburn, by September 6, 1952.

Persons who applied for the post advertised in the issues of May 8 and 15, 1952, need not re-apply as their applications will be considered with others received in response to this advertisement.

APPOINTMENT OF
THIRD ASSISTANT ENGINEER (CLERK OF WORKS)
Sub-Area Technical Engineer's Department, Kendal

Applicants should have had experience as clerk of works with thorough knowledge of all sections of the building trade, be capable of setting out, giving levels, measuring up, keeping all necessary site records and rendering reports. Maintenance and repair of Board's property will be included in duties.

Salary scale, £621-£648 p.a. Grade H.10. N.J.B. conditions.

APPOINTMENT OF GENERAL ASSISTANT ENGINEER
Commercial Department, Sub-Area Headquarters, Kendal

Duties will be to assist the power sales engineer in the application of industrial tariffs, power sales records, correspondence, estimates for industrial schemes, street lighting estimates, records, preparation of schedules, plans for agreements and to generally assist in collecting and collating all statistical information.

Salary scale, £503-£522 p.a. Grade H.13. N.J.B. conditions.

APPOINTMENT OF SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER
Penrith District

Duties will be to assist the district commercial engineer in dealing with consumers' requirements and enquiries on all matters including sale and installation of apparatus, repairs and maintenance, emergency service and tariffs, new supplies and development in urban and rural areas, control of workshops and service centres, and preparation of specifications and estimates.

Salary scale, £613-£623 p.a. Grade D.7. N.J.B. conditions.

APPOINTMENT OF GENERAL ASSISTANT DISTRICT COMMERCIAL ENGINEER
Barrow District

Duties will be to deal with all matters concerning the utilisation of electricity for domestic, commercial and, in particular, agricultural purposes, including enquiries, sales, installations and tariffs.

Salary scale, £504-£521 p.a. Grade E.11. N.J.B. conditions.

Applications for the above posts to Sub-Area Manager, No. 6 Sub-Area, The North Western Electricity Board, Castle Green, Kendal, by September 6, 1952. (A 697)

BRITISH ELECTRICITY AUTHORITY

London Division

ASSISTANT TURBINE HOUSE SUPERINTENDENT
Battersea Generating Station

APPLICATIONS are invited for the above superannuable post.

Qualifications; sound engineering training with technical qualifications to Higher National Certificate standard followed by practical experience of Modern Turbine Plant and E.H.T. Switchgear.

Salary and conditions of service in accordance with N.J.B., Schedule "A," Class "L," Grade 7—£946 1s., per annum, inclusive of London allowance.

Applications stating age, qualifications and experience to Divisional Secretary, B.E.A., London Division, Ergon House, Horseferry Road, S.W.1, within 14 days of this advertisement. (A 694)

WELLINGTON CITY CORPORATION

New Zealand

TRAMWAYS AND ELECTRICITY DEPARTMENT
DEPUTY METER ENGINEER

APPLICATIONS are invited for the above appointment, candidates should be corporate, or graduate members of the Institution of Electrical Engineers with qualifications in electrical measurements and experience in the testing and repair of electricity meters and instruments, either with a manufacturer or with a supply authority.

Salary £815 to £878 per annum, superannuation fund. Age 30 to 40 years.

Further particulars and application forms may be obtained from the undersigned within 14 days from the date of this advertisement.

PREECE, CARDEW AND RIDER.
8-10 Queen Anne's Gate,
London S.W.1. (A 636)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following appointments:—

Vacancy No. 74/52
ASSISTANT SHIFT CHARGE ENGINEER
North Wilford Power Station, Nottingham

Applicants should preferably possess the Higher National Certificate or its equivalent, and have had responsible experience in the operation of modern power station plant. Pulverised fuel experience will be an advantage.

Salary for the appointment will be in accordance with Class "K," Grade 9 (£741-£771 per annum) of the National Joint Board Agreement.

Vacancy No. 76/52
ASSISTANT SHIFT CONTROL ENGINEER
Freemen's Meadow Power Station, Leicester

Applicants should have had operational experience in the control room of a modern power station and should hold the Ordinary National Certificate in engineering.

Salary for the appointment will be in accordance with Class "H," Grade 14 (£479-£496 per annum) of the National Joint Board Agreement.

Closing date for the above appointments, September 8.

Vacancy No. 79/52
STATION CHEMIST
North Wilford Power Station, Nottingham

Applicants should preferably hold the B.Sc. degree in chemistry or be associates of the Royal Institute of Chemistry and must have had considerable experience in the chemical and physical testing of coal, oil and water and in the application of the results of such tests to power station operation.

The salary will be in accordance with Class "K," Grade 7 (£844-£881 per annum) of the N.J.B. Agreement.

Closing date for the above appointment, September 15.

Vacancy No. 83/52
MALE ASSISTANT
Purchasing Department, Divisional H.Q.

The successful applicant will be responsible for obtaining supplies of stationery, office furniture, cleaning materials and general stores. Actual experience in buying is essential, and knowledge of the order progressing and records systems applicable to a large undertaking is desirable.

The salary for this appointment will be in accordance with Grade 2 of the N.J.C. Agreement (£440-£500 p.a.).

Closing date, September 15.

The above posts will be pensionable within the provisions of the British Electricity Authority and Area Boards superannuation scheme.

Application forms may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned to the undersigned. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller.

August 22, 1952. (A 696)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, SENIOR ASSISTANT (Low Voltage Development) in the Commercial Department of the West Central Sub-area, Fforestfach.

Salary will be in accordance with Class "K," Grade 4 (£1,068/£1,092/£1,115) of the N.J.B. Agreement.

Applications stating age, present position and salary, qualifications and experience, and giving three referees, to be addressed to the Secretary to arrive by September 6, 1952.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (A 689)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

(1) CROYDON "A" AND "B" POWER STATIONS, MAINTENANCE ENGINEER (MECH). Applicants should preferably possess B.Sc. degree or equivalent and have had experience in the control of labour. Extensive experience in the maintenance of high-pressure turbine and boiler plant and power station auxiliaries essential. Class "K," Grade 6, £956 11s. p.a.

(2) Littlebrook Power Station. ASSISTANT SHIFT CHARGE ENGINEER. Technical qualifications equivalent to Grad. membership of either Institution of Mechanical or Electrical Engineers. Responsible experience of the operation modern high-pressure power station plant and good knowledge of efficient operation of boiler and turbine plant essential. P.F. experience advantageous. Class "J," Grade 9, £733 19s. p.a.

N.J.B. conditions for both positions. Salaries quoted include London Allowance.

Applications on forms obtainable from Station Superintendent: (1) Croydon "B" Power Station, Beddington Farm Lane, Purley Way, Croydon, Surrey; (2) Littlebrook Power Station, near Dartford, Kent, should be received by the appropriate Station Superintendent by September 15, 1952. (A 720)

A FULLY SKILLED ARMATURE WINDER for repair shop. Top rate, bonus, 5-day week, and all holidays paid, etc.—The Lewis Electric Company, Moor Works, Blackamoor Lane, Maidenhead. (A 703)

ARMATURE WINDERS and FITTERS. Experienced men required for heavy electrical plant. Excellent earnings and working conditions.—Apply Labour Office, General Electric Co., Ltd., Witton, Birmingham, 6. (A 718)

ASSISTANT SECTION ENGINEER required by the Merseyside and North Wales Electricity Board in the Southport District. Salary £567/£579 per annum (N.J.B. E/9).

Applicants must have received a thorough technical training and obtained the Higher National Certificate in Electrical Engineering or equivalent qualification, and possess sound experience in the design, construction and operation of h.v. networks, substations and m.v. networks up to and including 6.6 kV.

The appointment will be superannuable and subject to medical examination.

Application forms obtainable from the Manager, No. 1 Sub-Area, MANWEB, 24 Hatton Garden, Liverpool 3. Closing date September 9, 1952. (A 678)

CABLE FOREMEN and SITE ENGINEERS experienced in working on Air Ministry sites required by Scottish Contractors with work in all areas of Scotland and England. Good wages, conditions and superannuation.—Apply giving full particulars and salary required to Box No. 1951, Electrical Times. (A 645)

CABLE JOINTERS, Linesmen and Foremen Linesmen required by leading Scottish Electrical Contractors for work in all areas of the United Kingdom. Applicants must have good experience with voltages up to at least 11,000. Good wages, conditions and superannuation.—Apply Box No. 1941, Electrical Times. (A 614)

DESIGN and development. ASSISTANT to chief designer required by switchgear manufacturers in South west England. Draughtsman with good mechanical and electrical knowledge, and preferably with previous experience of medium voltage switchgear development. Applicants should be 25/35 years of age, and should have National Certificate or equivalent. Progressive and permanent position with good salary for man with initiative.—Box No. 1967, Electrical Times. (A 707)

DRAUGHTSMAN for transmission line work preferably with experience of profiles and a good knowledge of sag and tension calculations.—State age, experience and salary required to Box No. 609 Keith and Co., Advertising Agents, Edinburgh. (A 702)

ELECTRICAL EXPERIMENTAL ENGINEER required for light mechanical and electrical works in Southern England. Good knowledge of induction motors together with a practical experience of at least three years required. Age preferably 25 to 35 years. The products at present manufactured include induction motors up to 5 h.p. and small a.c./d.c. apparatus. Special consideration will be given to applicant who possesses drawing office experience, and who can carry out the development and design work of electrical equipment. Please state past experience and salary required.—Box No. 1945, Electrical Times. (A 622)

ELECTRICIAN with good all-round experience required. London area. Good possibilities for advancement for worker. Give age, experience.—Box No. 1973, Electrical Times. (A 719)

ESTIMATOR required with experience in preparing tenders for all classes of a.c. and d.c. electrical rotating machinery, switchgear, etc., and familiar with standard specifications. 5-day week. Pension scheme.—Applicants should state age. Full details of experience, salary expected to Personnel Manager, Lancashire Dynamo and Crypto (Mfg.), Ltd., Trafford Park, Manchester, 17. (A 673)

HANDLEY PAGE (Reading) LIMITED, The Aerodrome, Woodley, Reading, have a vacancy in their Design Office for a SENIOR ELECTRICAL DRAUGHTSMAN. They have an interesting project in hand and the post is progressive and offers good scope for advancement to the right man.—Please send full particulars to The Personnel Officer. (A 649)

IMPORTANT position available to Steel Tank Mercury Arc Rectifier qualified DESIGNER. Applicants should be well experienced in the engineering design and manufacture of this class of rectifier.—Apply, giving full particulars of experience, to Box No. 1957, Electrical Times. (A 682)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

LONDON COUNTY COUNCIL requires (a) TECHNICAL ASSISTANTS and (b) JUNIOR TECHNICAL ASSISTANTS. Should have expce. electric lift work, be able examine reports from outside staff and assess nec. work, make surveys and recommendations for improvements. Applicants for (a) should have Higher Nat. Cert. (Elec.) or equiv., for (b) Ordinary Nat. Cert. (Elec.) or equiv. Salaries up to (a) £696, (b) 201s.—Apply within 14 days on form from Chief Engineer (quote 52/29), County Hall, London S.E.1. (684) (A 680)

LOW VOLTAGE BULBS, motor car, cycle, telephone, etc. FOREMEN wanted for Stem-making, Welding, Sealing, etc. South-west London area. Good remuneration for fully qualified persons used to handling labour. Housing accommodation available.—Box No. 1963, Electrical Times. (A 701)

RESEARCH ENGINEERS and PHYSICISTS. A. Reyrolle and Co., Ltd., have a number of vacancies for senior research personnel to be engaged on all aspects of engineering and scientific research connected with h.v and e.h.v. switchgear, including circuit-breaking, insulation, system conditions, protection and instrumentation. Applicants should be Graduates of a British University preferably with an Honours Degree and have had previous experience on this type of work. Salaries commensurate with present-day levels; excellent working conditions with modern fully equipped laboratories; superannuation scheme.—Applications, which will be treated in strictest confidence, to be submitted with full particulars to the Chief Engineer, A. Reyrolle and Co., Ltd., Hebburn, Co. Durham. (A 675)

SALES AND ESTIMATING ENGINEER required for export department in Westminster covering electric motors and associated equipment. Excellent prospects for engineer with energy, initiative and knowledge of DMA/DMX.—Full details to F.H.S., Lancashire Dynamo and Crypto (Mfg.) Ltd., 94 Petty France, Westminster, S.W.1. (A 629)

SALES ENGINEER required by The Benjamin Electric Ltd., to operate the area covered by the South Wales Electricity Board for the sale of industrial and commercial lighting fittings. Applicants should have sales experience, preferably in South Wales, and knowledge of illuminating engineering.—Write, detailing education, experience, past and present employment, age, etc., and remuneration required, to the Area Manager, The Benjamin Electric Ltd., 5 Corporation Street, Birmingham 2. (A 628)

SENIOR DRAUGHTSMAN required for work on Electrical Power Resistances and large electric heaters for industrial applications. Previous experience on this class of work desirable but not essential.—Apply by letter with full details including age, technical qualifications, whether married or single, and salary required, to Box No. 1965, Electrical Times. (A 706)

FOR INDIA

AN old-established and well-known Company in India representing several reputable English manufacturers requires an ELECTRICAL SALES ENGINEER normally for employment in Bombay or Calcutta or Madras. Age preferred 22 to 28. Applicant must hold degree in Electrical Engineering or equivalent from a U.K. University and have had two years' practical experience with an approved U.K. manufacturer. Preference given to man having training and experience with switchgear manufacturing and estimating. Three years' agreement and six months leave (with pay) from India if offered second agreement after termination. Initial kit allowance £75. First-class passages. Monthly salary for single man 1,100 rupees first year, 1,200 rupees second year, 1,300 rupees third year, plus local monthly allowance 250 rupees. Additional allowance if married. Mutual contributory Provident Fund. Application must give full details of education, qualification, training and experience, and will be treated confidentially.—Box No. 1943, Electrical Times. (A 615p)

SIMPSON, BAKER AND CO., LTD., Electrical and Radio Wholesalers, require an experienced SALES ORDER CLERK at the Birmingham branch. Applicants should be fully conversant with cables, motors, switch and control gear, accessories and electric tools, and be able to handle enquiries and conduct correspondence with Industrial Customers.—Apply in writing to: Director and General Manager, 15/17 Bute St., Luton, Beds. (A 704)

SIMPSON, BAKER AND CO., LTD., Electrical and Radio Wholesalers, require a SALES MANAGER to operate with team of representatives in London, Middlesex, Kent, Surrey and Sussex. Good salary, commission, expenses, with supperannuation, to experienced man with connections.—Apply to: Director and General Manager, 15/17, Bute St., Luton, Beds. (A 705)

SMALL ELECTRIC MOTORS LTD., Eagle Works, Churchfields Road, Beckenham, Kent, require AGENT for sale of motors up to 10 h.p. for the West country. Must have knowledge and experience of electric motors and applications. Retainer and commission.—Apply Personnel Manager. (A 717)

TECHNICAL SALES ASSISTANT required for large West London firm of electrical instrument and control gear manufacturers. Higher National Certificate or equivalent educational standard. Some knowledge of foreign languages desirable but not essential. Age approximately 25 years. Write in detail concerning education, experience, and salary required.—Box No. 1961, Electrical Times. (A 684)

TRANSFORMER DRAUGHTSMAN, age 26/30 years, required for rectifier transformers. Should have sound drawing office experience.—Please reply, giving age, details of experience and salary required, to Nevelin Electric Co., Ltd., Purley Way, Croydon. (A 578)

APPOINTMENTS WANTED

B.Sc.(ENG.), A.M.I.MECH.E., A.M.I.E.E., 39 years old; ex-B.T.H. student apprentice; 3 years captain R.E.M.E. India-Egypt; 8 years' experience technical sales switchgear (h.t. and l.t.) transformers, rotating plant, control gear, instruments, etc., seeks responsible post, preferably in sales (but others considered) in London, Home Counties or South Wales areas. Extensively travelled abroad. Willing travel in Europe or America for inspections, negotiations, etc.—Box No. 1947, Electrical Times. (A 631)

70 ACCOUNTS opened in a year. Personable ex-R.A.F. S/Leader, Signals, seeks sound SALES APPOINTMENT. Single, car, mobile, located in London.—Box No. 1925, Electrical Times. (A 570)

WANTED

A.C.-D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5105. (A 11)

WANTED, D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London N.1. (A 7)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper, Ltd., 176 Brady Street, Bethnal Green, E.1. (A 1)

WANTED, ROTARY CONVERTORS, any size.—Universal, 221 City Road, London E.C.1. (A 9)

WANTED. Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock Water-tube boilers. Best prices paid. Prepared to purchase Babcock and Wilcox Water-tube boilers for dismantling. —Apply, giving full details, to Midland Iron and Hardware Co., Cradley Heath, Staffs. (A 3)

£50,000

Immediate cash available for purchase of New Ball and Roller Bearings, all types, Steel Balls and Rollers. Top prices paid. Purchases from Traders only.

CLAUDE RYE BEARINGS

895-921 Fulham Road, London, S.W.6

RENown 6174 (20 lines) (A 328p)

WASTE MERCURY urgently wanted; packing instructions sent: also aircraft sparking plugs, platinum contacts (new or used) and scrap precious metals in any form. Please forward samples, stating quantities. Immediate cash on collection. Non-ferrous metals also bought. —Belgrave Buyers (E.T.), 5 Belgrave Gardens, London, N.W.8. MAI 7513. (A 710)

WORK WANTED

A.C. and d.c. Motor Rewinds and Repairs. Prompt service, fully guaranteed. Edgware 5566 (4 lines). —Service Electric Co., Ltd., Stanmore, Middx. (A 19)

CASTINGS. Fisher Foundries, Ltd., Greet, Birmingham, have capacity for brass, gun metal and soft grey iron machine moulded repetition castings weighing 1-30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts. Tel.: B'ham, Victoria 0197. (A 647)

CONDENSER AND TRANSFORMER CASES. Special boxes and covers. Sheet metal and press-work for the electrical trade. May we quote you? A.I.D. approved.—Conway-Tolhurst Ltd., Airport, Cardiff. (A 613)

MOTOR GENERATOR SETS built to customers requirements from new and/or modern reconditioned machines. Guaranteed for twelve months. Good deliveries, competitive prices. Enquiries to Thos. W. Ward, Ltd., Albion Works, Sheffield. Tel. 23611 (Ext. 347). (A 709)

PRESSINGS. Assemblies, wire work, spot and arc welding, capstan work. Quick service. Large quantities material available. Quotations by return. Specialists in sub-contract work.—Mountsorrel Pressings, 14-20 Loughborough Road, Mountsorrel. (A 419)

WELDING WORK WANTED. Large capacity available in all materials and methods. Keen prices and good workmanship. Difficult jobs our speciality. A.I.D. approved.—Conway-Tolhurst Ltd., Airport, Cardiff. (A 612)

AGENCIES

AGENTS REQUIRED by well-established manufacturers of Immersion Heaters, Space Radiators, etc., for several areas of the British Isles other than Gt. London. Car essential. Must have solid connections with reputable wholesalers. Salary and commission or commission only basis.—Box No. 1969, Electrical Times. (A 708)

INTRODUCTORY COMMISSIONS payable to firms or persons, on sales of brass, aluminium, copper rods, sheets and tubes, at competitive prices.—Box No. 1931, Electrical Times. (A 585)

FOR SALE

CABLES & WIRE

4,000 yards 0·06 four-core P.I.L.C.S.W.A. and S. 660 V. New C.M.A. Cable. Test certificates available.—A. and H. Evans, 65 Birkbeck Road, Ilford, Essex. (A 634)

ENGINEERING PLANT & MATERIALS

ALUMINIUM ALLOY, new flat sheets, size 6 ft x 3 ft x 24 gauge. Price per lb. ex Works, 1 cwt. 3/6, 5 cwts. 3/4 per lb.; 10 cwts. 3/2 per lb.; 1 ton 3/- per lb., 2 tons 2/11 per lb.; under 1 cwt., 25/- per sheet. Approximate weight of each sheet 6 lbs. Available ex-stock.—D. McMaster and Co., Ltd., Mount Bures Works, Mount Bures, Essex. Tel.: Bures 351/2. (A 445)

BERYLLIUM COPPER STRIP: ¼ in. x 26.G; ½ in. x 28.G—¾ in. x 28.G; in coil.—Parnall (Yate) Ltd., Yate, near Bristol. Tel.: Chipping Sodbury 3231. (A 711)

750,000

NEW BALL RACES, ROLLER, THRUST AND TIMKEN RACES IN STOCK. STOCK LISTS AVAILABLE.

CLAUDE RYE BEARINGS

895-921 Fulham Road, London, S.W.6
RENown 6174 (20 lines) (A 329p)

WELDING EQUIPMENT. Four 10 kVA, 200/500 V., 50 c/s, Transformer Welding Equipment by Actaro, output 15/200 amps.

D.C./D.C. Motor Generator Welding Set by Quasi Arc/Laurence Scott, 480 V d.c., output 20/80 V, 200 amps, ball bearings, with starter, voltmeter and ammeter, mounted on bogey.

Several 22/32 kVA Transformer Welding Sets, input 400 V, 50 c/s supply, double and single operator type, oil immersed Transformers, output 15/250 amps, max. range 500 amps, with regulators, mounted on bogeys.

200/440 V, 50 c/s supply, air-cooled Transformer Welding Set by Metropolitan Vickers, "Thermac" type, output 85/95 V, 300/450 amps, with regulator and ammeter.

Oil-immersed Transformer Welder by English Electric Co., 400 V, 50 c/s input, output 5/300 amps. Also switch giving low, medium and high output. With regulator.

36 kVA Sciaky Spot Welder, 400 V, 50 c/s supply, water-cooled electrodes, pneumatic operated head by foot switch, 18 in. throat, tapping switch giving short, medium and long welds, with Ignanic timer.

250-amp. single operator petrol-driven Welding Generator Set comprising Morris four-cylinder engine, hand starting, complete with daily fuel tank, usual accessories for engine, direct coupled to 7·5 kW, 30 V, 250-amp. d.c. generator, ammeter, voltmeter. On fabricated chassis.

Petrol-driven Welding Set comprising six-cylinder engine, electric starting, direct coupled Welding Generator, 16/80 V, 625/312 amps, in-built exciter running at 1,500 r.p.m., complete with current regulator, voltmeter, ammeter.

George Cohen Sons and Co., Ltd., Wood Lane, London W.12 (Tel.: Shepherds Bush 2070), and Stanningley, near Leeds (Tel.: Pudsey 2241). (A 674)

GENERATING PLANT

DIESEL ALTERNATOR SETS in stock up to 500 kVA, 400/440 V, 3-phase, 50 c/s, 4-wire. Detailed stock list post free on request.—Thos. W. Ward, Ltd., Albion Works, Sheffield. Tel.: 26311 (Ext. 347). (A 712)

TENDERS are invited for the removal of a 32-h.p. Ruston Hornsby horizontal DIESEL ENGINE with compressed starter and belt driven 1,050 r.p.m., 75 amp dynamo, 200/300 volts, 15 kW d.c., also switchboard. The dynamo and switchboard by J. H. Holmes and Co., Newcastle-on-Tyne. Also 108 "C" type cells.—For further particulars apply to Powlett and Flood, Chartered Surveyors, 24 Milsom Street, Bath. Telephone 4677. (A 676)

LIGHTING EQUIPMENT

PURLEY CHOKES AND BALLASTS. Our 80 W Tapped h.p.f. Ballast, with Starter Switchgear-holder incorporated, is proving itself the most popular unit. Suitable for most fittings. 57/6 each, subject.—F. W. Blanshard, Ltd. (Dept. ET), Purley, Surrey. Uplands 4818-9. (A 20)

METERS

A.C./D.C. QUARTERLY and SLOT METERS.—Brent Electrical Co., 6 Holmdale Gardens, N.W.4. (A 8)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Road, London, E.C.1. (A 14)

METERS, a.c. and d.c., new and reconditioned, all types. Quarterly, single and 3-phase, 3- and 4-wire 2½ to 1,000 amp. Prepayment, single and double tariff, single, dual and triple coin, fixed and variable tariff, 2½ to 50 amp. M.D.I. .Billiard Switches, Rent Collectors. Prices from 5/-, carriage paid. Guaranteed for ever. Immediate delivery.—Illustrated catalogue from the Electric Meter Company, Castor Road, Brixham. (A 170)

MOTORS & STARTERS

A.A. ELECTRICAL CO. FOR A.C.-D.C. MOTORS, SWITCHGEAR, EXHAUST FANS, HOISTS, REDUCTION GEARS, new or reconditioned units.—Chiswick 5105, Chiswick 5605, 67 Rothschild Road, W.4. (A 10)

A.C. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works, Ltd., Milo Road, East Dulwich, S.E.12. (Forest Hill 2278-9). (A 5)

A.C. and D.C. MOTORS, GENERATORS, from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5566/9. (A 13)

A.C. and D.C. MOTORS, GENERATORS, SWITCHGEAR, etc., always in stock. Let me have your inquiries.—G. E. Whittaker, Wellington Mill, Bolton Road, Blackburn. Tel. 7322. (A 6)

A.C. MOTORS, BRAND NEW. Delivery from stock. Fractional to 200 h.p., 600, 750, 1,000 and 1,500 r.p.m., 400/440 V, 3-phase, 50 c/s, with or without control gear. Also numerous reconditioned a.c. and d.c. motors and other electrical plant. Detailed price stock list post free on request.—Thos. W. Ward, Ltd., Albion Works, Sheffield. Tel. 26311 (Ext. 347). (A 713)

All types and sizes of

Industrial Electrical Equipment

ELECTROPOWER COMPANY LIMITED
Kingsbury Works, Kingsbury Road, London, N.W.9
Telephone: COLindale 4621/2. (A 18p)

CROMPTON PARKINSON MOTORS, 1/6 h.p. 1/230/50. New, £3 18s. 6d. Carriage 5s. 6d. B.T.H., ¼, 1/230/50, £5. Carriage 5s. 6d. 400 other motor bargains.—L. C. Northall, 16 Holly Road, Quinton, Birmingham 32. (A 633)

FOR ELECTRICAL MOTORS, GENERATORS, ALTERNATORS, SWITCHGEAR, please send your inquiries to Oldfield Engineering Co., Ltd., 96 East Ordsall Lane, Salford 5. (A 16)

FRACTIONAL H.P. MOTORS, as new, ex-stock, a.c./d.c. Universal, B.T.H., Delco-Remy, G.E.C., Fracmo., Newman, Scophony.—Jeary Electrical Co. Ltd., 5 Lamb's Buildings, London E.C.1. (A 28)

SWITCHGEAR

MERCURY SWITCHES are made by Hall Drysdale and Co., Ltd., of 58 Commerce Road, Wood Green, London N.22. Tel.: Bow 7221. (A 15)

TRANSFORMERS & CONVERTORS

TWO 1,000 kVA outdoor type TRANSFORMERS by Johnson and Phillips, new 1941, ratio 10,750/400 volts, 3 phase, 50 cycles, fitted with trifurcating boxes, off load tapping switch, etc. As new.

Two B.T.H. Draw out type H.T. SWITCHES, complete with meters, etc., for above, new 1941.

Two Crompton Parkinson L.T. Drop down type SWITCHES with meters, etc., for above, new 1941.

Two Crompton Parkinson 4-panel L.T. SWITCHBOARDS, 400/3/50, fitted with 600 amp. drop down type circuit breakers, meters, etc.

F. Burrill and Co., 109 Pencisely Road, Llandaff, Cardiff. Telephone: Llandaff 95. (A 617)

UNCLASSIFIED

BEAUMONT CABLE-DRAG SCRAPER SYSTEM, 156 tons coal per hour, 150 ft haul, 5,000 lb capacity scraper, 470 ft per minute; spares also available.—Full details, Purchasing and Stores Officer, British Electricity Authority, Lower Ham Road, Kingston-on-Thames. (A 715)

MORRISON ELECTRIC TRUCK, 1947. Hydraulic tipping gear, side loading, 2½ tons capacity, complete with automatic charger.—Full details, Purchasing and Stores Officer, British Electricity Authority, Lower Ham Road, Kingston-on-Thames. (A 714)

BUSINESSES FOR SALE

ELECTRICAL CONTRACTING BUSINESS (North London). Including van, trade tools, stock, etc. Lock-up shop at low rent. Phone installed.—Box No. 1971, Electrical Times. (A 716)

MISCELLANEOUS

CITY AND GUILDS (Electrical, etc.) on "No pass-No Fee" terms. Over 95% successes. For full details of modern courses in all branches of Electrical Technology send for our 144-page handbook FREE and post free.—B.I.E.T. (Dept. 39), 17 Stratford Place, London W.1. (A 54)

FREE! Brochure giving details of courses in ELECTRICAL ENGINEERING and ELECTRONICS, covering A.M.Brit.I.R.E., City and Guilds, etc. Train with the Postal Training College operated by an Industrial Organisation. Moderate fees.—E.M.I. Institutes, Postal Division, Dept. ET.29, 43 Grove Park Road, London, W.4 (Associate of H.M.V.) (A 305)

THERMODARE

THERMODARE

ELECTRIC THERMAL STORAGE SPACE HEATERS

are helping to solve the country's fuel problems

Thermodare heaters take in electrical energy only during the night hours, but give continuous heating throughout the 24 hours.

The Thermodare system of heating has been acclaimed by Engineers as the "greatest advance in space heating during the past 50 years."

This new form of Central Heating by Electricity has the advantages of low installation costs, very attractive appearance, is absolutely clean in its use, and requires no attention.

THERMODARE Heaters are ideally suited for installation in Offices, Schools, Institutions, Churches, etc.

For further information apply to the Manufacturers

ABERDARE ELECTRIC COMPANY LTD

Dublin · Ireland

Personally represented in Britain by E. C. Green, Little Reeves, Amersham Common, Bucks.

INDEX TO ADVERTISERS

Aberdare Electric Co. Ltd. ... 57
Aluminium Wire & Cable Co., Ltd. 3
Ashdowns, Ltd. 28
Attwater & Sons 44
Automatic Coil Winder & Electrical Equipment Co., Ltd. ... 20
Automatic Light Controlling Co., Ltd. 66
Automatic Telephone & Electric Co., Ltd. 69
Babcock & Wilcox, Ltd. 1
Benjamin Electric, Ltd. 42
Birch, H. A., & Co., Ltd. ... 35
British Die Casting & Engineering Co., Ltd. 18
British Insulated Callender's Cables, Ltd. 17
British Power Transformer Co., Ltd. 38
British Thomson-Houston Co., Ltd. 37, 72
Brook Motors, Ltd. 70
Browning's Electric Co., Ltd. ... 44
Brush Electrical Engineering Co., Ltd. 63
Burco, Ltd. 59
Cable Makers' Association ... 29
Chilton Electric Products, Ltd. 36
Clyde Blowers, Ltd. 40
Cole, E. K., Ltd. 12
Cressall Manufacturing Co., Ltd. 4
East London Mica Works ... 32
Edwards, F. J., Ltd. 68
Electrical Times 68
English Electric Co., Ltd. 33, 65
Eva, Alfred, & Son, Ltd. 66
Ferranti, Ltd. 27
Fischer Bearings Co., Ltd. ... 7
General Electric Co., Ltd. 46, 48
Green, E., & Son, Ltd. 31
Grelco, Ltd. 68
Griffiths, Gilbart, Lloyd & Co., Ltd. 36
Grubb Engineering Co., Ltd. ... 38
Heatrae, Ltd. 19
Henley's W.T. Telegraph Works, Co., Ltd. 49
Higgs Motors, Ltd. 10
Horstmann Gear Co., Ltd. ... 32
Isenthal & Co., Ltd. 66
Johnson & Phillips, Ltd. 25
Kolectric, Ltd. 12
London Electric Wire Co., & Smiths, Ltd. 67
Low, Duncan, Ltd. 40
McKechnie Bros., Ltd. 43
Metropolitan-Vickers Electrical Co., Ltd. 30
Metway Electrical Industries, Ltd. 60
Midland Electric Manufacturing Co., Ltd. 8
Moss, William, & Sons, Ltd. ... 12
Mudie's Electrical Co., Ltd. ... 22
Nalder Bros. & Thompson, Ltd. 9
Newton Bros. (Derby), Ltd. ... 24
New Switchgear Construction Co., Ltd. 68
Nu-Swift, Ltd. 62
Parmiter Hope & Sugden, Ltd. ... 71
Parsons, C. A., & Co., Ltd. ... 21
Partridge Jones & John Paton, Ltd. 6
Partridge Wilson & Co., Ltd. ... 22
Pinchin Johnson & Co. 58
Plasticable, Ltd. 62
Powell Duffryn Carbon Products, Ltd. 34
Process Control Gear, Ltd. ... 4
Quicksilver Tube Manufacturing Co. 64
Reyrolle, A., & Co., Ltd. ... 13
Rowlands Electrical Accessories, Ltd. 15
Rozalex, Ltd. 64
Sanders, Wm., & Co. (Wednesbury), Ltd. 62
Sangamo Weston, Ltd. 50
Saxonia Electrical Wire Co., Ltd. 64
Scemco, Ltd. 24
Scottish Cables, Ltd. 11
Shell-Mex & B.P., Ltd. 14
Siemens Electric Lamps & Supplies, Ltd. 45
Simmonds & Stokes (Niphan), Ltd. 62
Simplex Electric Co., Ltd. ... 2
Smart & Brown (Engineers), Ltd. 16
Standard Telephones & Cables, Ltd. 23
Sturdy Electric Co., Ltd. 66
Sutcliffe Speakman & Co., Ltd. ... 34
Taylor Tunnicliff & Co., Ltd. ... 5
Thomas, Richard, & Baldwins, Ltd. 41
Thorpe, F. W., Ltd. 28
T. M. C. Harwell (Sales), Ltd. ... 26
Tricity Cookers, Ltd. 4
Thorn Electrical Industries, Ltd. 61
Universal Engineering Co. ... 68
Westinghouse Brake & Signal Co., Ltd. 39
Whitecross Co., Ltd. 64
Wilkinsons Tools, Ltd. 16
Wootton & Co., Ltd. 60

MINERVA
ELECTRICAL INSULATING VARNISHES

STOVING VARNISHES (Natural Resin Type)

STOVING VARNISHES (Synthetic Resin Type)

THERMO-SETTING VARNISHES

AIR-DRYING VARNISHES

CLOTH VARNISHES

CORE-PLATE VARNISHES (Stoving and Air-Drying)

COPPER-WIRE ENAMELS (Oleo-resinous and Synthetic Types)

All the above are supplied in black & clear

ACID & HEAT RESISTING ENAMELS

Available in all colours

MICA BONDING VARNISHES

COIL STICKING VARNISHES

SLEEVING VARNISHES (Black, Clear and Colours)

CABLE LACQUERS (Non-flam., Cellulose Type and P.V.C.)

COMPOUNDS Various types

Our Insulating Varnish Department includes research and testing laboratories: the service of specialists is available to any manufacturer or engineer concerned with problems of insulating materials and their application.

All the materials listed conform to B.S. Specifications wherever applicable

PINCHIN JOHNSON & CO.

4 CARLTON GARDENS, LONDON, S.W.1 Telephone: TRAfalgar 5600

Burco

CATALOGUE No. 10P
ALL-ELECTRIC
WASHING MACHINE
(fitted with pump)

This newest Burco model is advertised in a host of front rank magazines appealing to women, reaching millions of readers, all of whom will be interested in labour saving appliances. Be ready for enquiries —stock Burco . . . .

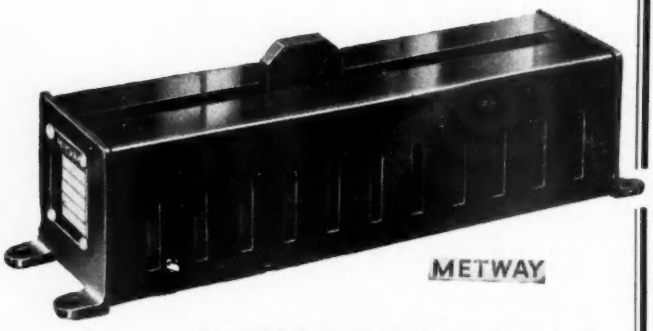
THE *Aristocrat* OF ALL-ELECTRIC WASHING MACHINES

BURCO LTD ROSE GROVE BURNLEY LANCS

METWAY PRODUCTS
Registered Trade Mark

SLIDING DIMMERS

100W—5,000W STANDARD SLIDER
(AS ILLUSTRATED)
OR
GEARED TYPE
FOR FRONT OR EACK OF BOARD MOUNTING



Also
ROTARY OR FIXED RESISTANCES
For Home Projectors, etc.

FOR FULL DETAILS OF OUR RANGE, ASK FOR LIST No. JYJ/30/TE
(Please enclose 6d. in stamps to cover postage).

METWAY ELECTRICAL INDUSTRIES LTD.
KING STREET, BRIGHTON 1.
Tel: Brighton 28366 Grams: Metway, Phone, Brighton

WOOTTON
METER BOARDS
AND SWITCH BLOCKS

We have been making and supplying the Electrical Industry with METER BOARDS and Switch Blocks for over 27 years

- *FIRST CLASS WORK*
- *QUICK DELIVERIES*
- *COMPETITIVE PRICES*

We invite your enquiries

WOOTTON & CO., LTD.
ALMA WORKS, PONDERS END, MIDDLX.
TELEPHONE: HOWARD 1858
L1048A

facts.....about

ATLAS FLUORESCENT

The **'double-life'** WHITE (3500°K) fluorescent tube has the highest efficiency of any general purpose 5 ft. 80 watt tube in the world.

Average performance figures

Light output at 100 hours . .	4400 lumens
Average throughout life	3680 lumens
Light output at 5000 hours. . .	3360 lumens
Guaranteed average life	5000 hours
Drop in efficiency throughout life	23.6%

For the finest value in lighting today . . . . . .

ATLAS 'double-life' FLUORESCENT TUBES

Thorn

THORN ELECTRICAL INDUSTRIES LTD., LIGHTING DIVISION, 233 SHAFTESBURY AVE., LONDON, W.C.2

321

REGD. TRADE MARK
NIPHAN

WEATHERPROOF METAL-CLAD PLUGS, SOCKETS, SWITCH PLUGS, ETC.
for all electrical purposes

5 300 amp.
250 500 volts

Plug
Flange Angle Plug and Cover
Through Angle Socket and Cover
Interlocked Switch Socket with Cover and 3- or 4-pole Plug
Plain Socket

• APPLY FOR NEW REVISED PRICE LIST

SIMMONDS & STOKES (NIPHAN) LTD
MANUFACTURING ELECTRICAL ENGINEERS
Victoria House, Southampton Row, London, W.C.1 · Holborn 8637 and 2163

OVERSEAS AGENTS: S. AFRICA, Hubert Davies & Co., Ltd., Johannesburg. CEYLON, Walker & Greig, Ltd., Colombo.
NEW ZEALAND, Samuel Brown, Ltd., Wellington KENYA, R. W. Ketchley & Co., Nairobi, British East Africa

He always said...

"I know its overloaded, but if anything happens I can always blame the maker."

* Inspired by the well known "Yachting World" aphorisms appositely modified by

SANDERS
WEDNESBURY

P.V.C. Sleevings of Quality by
Inter-Service Approval

Plasticable Ltd
The Extruders
Hawley Lane, Farnborough, Hants
Telephone: Farnborough, Hants 85

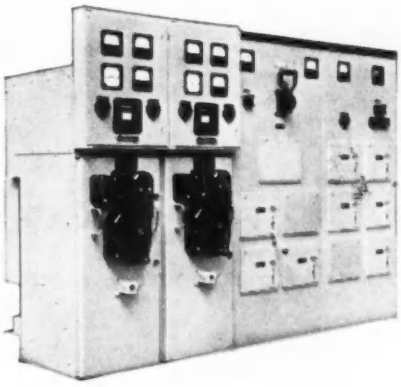
FIRE!
WHICH COLOUR
NU-SWIFT?
Red, blue or black? Distinctive colours for different fire risks prevent costly errors. Are your extinguishers the right colours? Write, or phone Elland 2852, for free advice.
NU-SWIFT LTD. · ELLAND · YORKS
In Every Ship of the Royal Navy

HOLME MOSS

SUTTON COLDFIELD

KIRK-O'-SHOTTS

Britain's great new television stations choose Brush – for the important low-voltage mains switchgear upon which so much depends behind the scenes. In this important control equipment is incorporated the 70 years' skill and experience of Brush electrical engineering.



and now at **WENVOE...**

the best answer is BRUSH

The Brush Electrical Engineering Co. Ltd. Loughborough, England (A member of the BRUSH ABOE Group)
London, Birmingham, Cardiff, Manchester, Leeds, Newcastle, Glasgow, Bath, Sheffield, Dublin

15-92

E

THE WHITECROSS COMPANY LIMITED, WARRINGTON. Established 1864 CVS-67

Dermatitis, production's greatest enemy, can soon put the best hands out of action. Where industrial irritants—insulating varnish, shellac, transformer and lubricating oils — are being constantly handled, Rozalex is essential. It creates a barrier against dermatitis. There is a type for every trade. Send for free sample and leaflet "The Skin in Industry" to Rozalex Ltd., 10 Norfolk Street, Manchester 2.

ROZALEX

DERMATITIS BARRIER PREPARATIONS

MORE— —THAN

FIFTY YEARS

SPECIALISATION IN —

INSULATED ELECTRIC WIRES, CABLES & FLEXIBLE CORDS

The SAXONIA ELECTRICAL WIRE Co. Ltd

ROAN WORKS GREENWICH S.E.10

Phones Greenwich 0463 · 1672 ◆ Grams: Saxonist London

FOR ALL TYPES OF

MERCURY SWITCHES

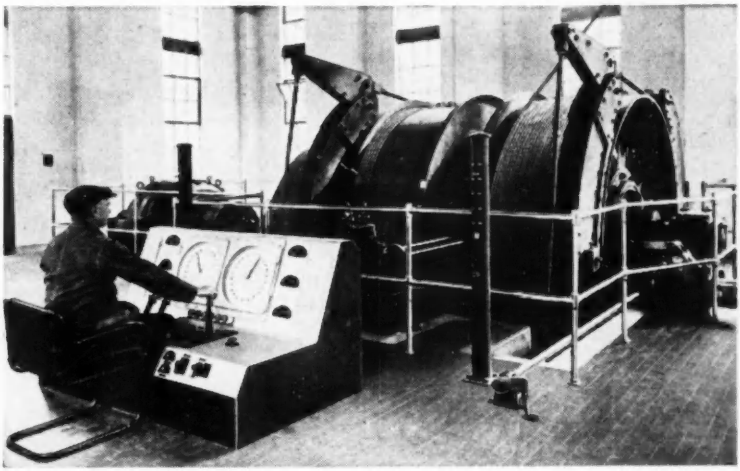
Apply Manufacturers

QUICKSILVER TUBE MFG. CO.

The Grays, High Street, Harlington, Middx.

Tel.: Hayes 1688

Control centralised at one desk



As a result of exhaustive study of the many factors involved in hoist operation, and with particular regard to the problems of safety, The ENGLISH ELECTRIC Company has developed a hoist control desk which centralises all signalling controls and instrumentation. This development provides greater safety and ease of control. All levers are so designed that only the smallest operating effort is necessary. Miniature precision depth indicators mounted immediately in front of the driver ensure adequate decking without change in focal vision, while correct finish to the desk eliminates glare and reduces eye strain.

'ENGLISH ELECTRIC'

mine hoists

THE ENGLISH ELECTRIC COMPANY LTD., Queens House, Kingsway, London, W.C.2

Mining Division, Stafford

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

MEW 7

Available for **HEAVY DUTY**

ISENTHAL

'N.C.' AUTOMATIC REGULATOR

gives accurate, rapid and reliable control of

VOLTAGE · SPEED · CURRENT
POWER FACTOR

of generators (and motors) of ALL SIZES (working singly or in parallel) under all conditions and in all circumstances; it is reliable even under "short circuit" conditions—thanks to simple and efficient anti-hunting features. No vibrating contacts—therefore no rating limitations. Control mechanism works under pressure oil, eliminating friction and wear. Automatically operated field rheostat is immediately available for hand regulation if required to meet special conditions.

Compensation for parallel operation and or over compounding readily provided.

Full data gladly supplied upon request. May we investigate your special problems?

ISENTHAL & CO. LTD. Ducon Works, Victoria Road
NORTH ACTON, LONDON, W.3. *Telegrams: Isenthal, London.* *Telephone: ACOrn 3904*

ls2

STURDY TRANSFORMERS

live up to their name

Sturdy Transformers are manufactured from 1kVA to 50kVA for all industrial applications and our technical service is always at your disposal.

Sturdy

ELECTRIC CO. LTD.

BURNOPFIELD (Telephone 237)
NEWCASTLE UPON TYNE

USE **"GUNFIRE"**
TRADE MARK
Time Switches
AND
Process Timers
FOR SATISFACTION
AUTOMATIC LIGHT CONTROLLING CO. LTD., BOURNEMOUTH
Established over 50 years

CARTONS AND DISPLAY OUTERS
QUALITY & SERVICE
ALFRED EVA & SON LTD
HARPER ROAD · WYTHENSHAWE · MANCHESTER

LEWMEX

REGD.

Winding Wires

TO CONFORM WITH B.S.S. 1844/1952
(recently issued)

the description of the grades of this wire will be changed.

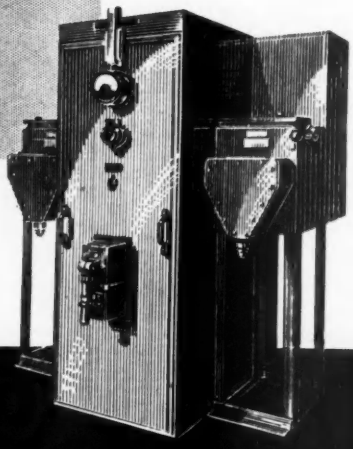
Old Style		New Style
LEWMEX F	=	LEWMEX F
LEWMEX H.F.	=	LEWMEX M
LEWMEX T.F.	=	LEWMEX T
LEWMEX Q.F.	=	LEWMEX X

Whilst for our mutual convenience our specification has been brought into line with the British Standard Specification, there is NO CHANGE in the high quality which has been known for so many years.

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED
LEYTON, LONDON, E.10.

Incorporating Frederick Smith & Co., Associated with The Liverpool Electric Cable Co. Ltd., and Vactite Wire Co. Ltd.

RING-MAIN SWITCHGEAR



150M.V.A at 6·6kV & 11kV
400Amp. Oil Immersed Isolator with ON, OFF, EARTH & TEST positions
Tee-off unit may be of the Draw-out Truck or stationary Cubicle type.

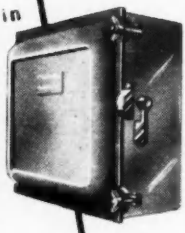
THE NEW SWITCHGEAR CONSTRUCTION CO. LTD.

WELLESLEY ROAD SUTTON SURREY TELEPHONE : VIGILANT 8234

Associated with the Hackbridge & Hewittic Electric Co. Ltd.

WHY NOT REPLACE YOUR CAST IRON SWITCH FUSE & JUNCTION BOXES, Etc., with ALUMINIUM !

Pressure and Gravity Die Castings in Aluminium and Zinc base alloys. Sand castings in Aluminium alloys, Gun Metal, Phosphor Bronze, Brass, etc.



Easier to machine. Rust free. Lighter to handle.

UNIVERSAL
ENGINEERING COMPANY
CASTLE BOULEVARD, NOTTINGHAM
Phone: Nottingham 45631/2
Grams: Lightning, Nottingham
London: CALLARD HOUSE, 74a, REGENT St. Phone: Regent 6170
CASTINGS FOR ALL TRADES

For new and used machine tools . . . power presses . . . sheet metal working and woodworking machinery, etc. . . . **F. J. EDWARDS, LIMITED**, 359-61, *Euston Road, London, N.W.1. Tel: Euston* 4681-3771. *'Grams: Bescotools Norwest London*

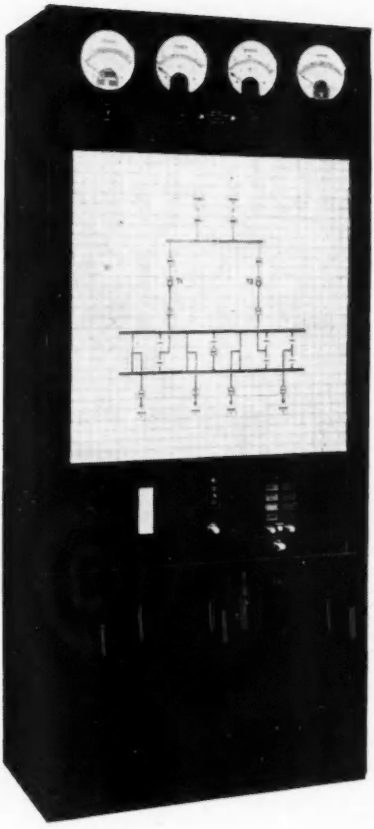
INSTRUCTION CHART
For dealing with apparent death from
ELECTRIC SHOCK
(In accordance with H.O. Electy. Reg. 29)
Mounted on strong board, varnished and corded for hanging
Price 3/- plus 11d. postage (per single copy)
ELECTRICAL TIMES
Sardinia House, Sardinia St. LONDON, W.C.2

Grelco
LIMITED

MULTI-PLUG ADAPTORS

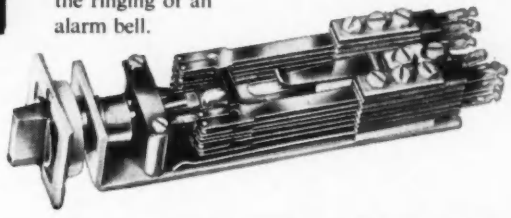
GRELCO WORKS
MINEHEAD, SOMERSET
Telephone and Telegrams: MINEHEAD 740

* *An important development*



MOSAIC DIAGRAM *with* CONTROL FACILITIES

With this equipment the engineer can exercise both control and supervision directly from the mosaic diagram. Each symbol incorporates a rotary switch for selection purposes and a miniature lamp which lights whenever the symbol does not line up with the position of the apparatus it represents. Selection is made by merely turning the appropriate symbol to the new position, a coded impulse train then automatically selecting the particular remote equipment. When the "selection correct" signal is returned, the desired operation can be performed. The tripping of circuit breakers at the remote station is automatically indicated at the control room by the flashing of the discrepancy lamp and the ringing of an alarm bell.



Symbol with rotary switch and discrepancy lamp

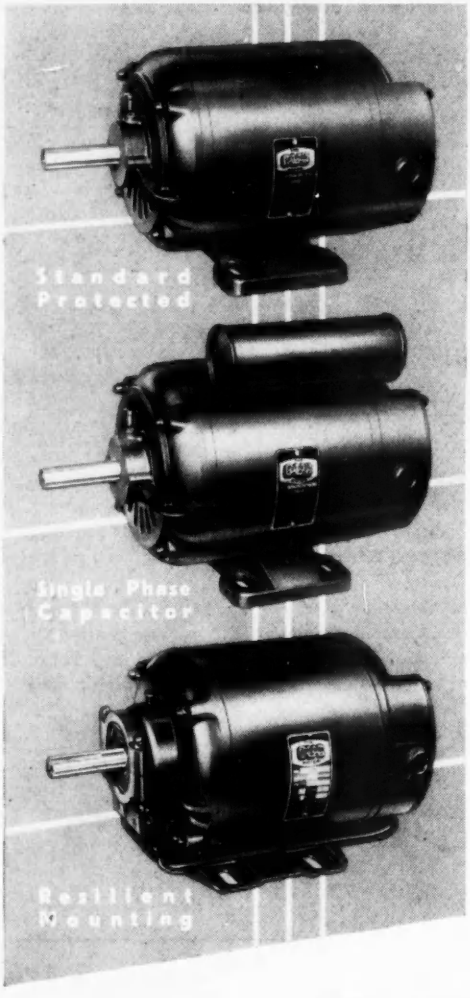
SUPERVISORY REMOTE INDICATION AND CONTROL EQUIPMENT.

AUTOMATIC TELEPHONE & ELECTRIC CO. LTD.

Strowger House, Arundel Street, London W.C.2. Telephone: TEMple Bar 4506.
Telegrams: Strowger, Estrand, London. Strowger Works, Liverpool, 7

AT. 4501-CX25

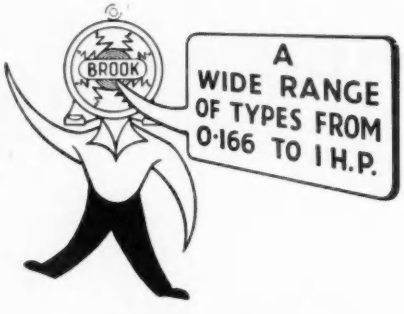
—a NEW range of FRACTIONALS



The BROOK GRYPHON

Strongly built and pleasing in appearance, the Gryphon motor may be fitted with confidence to domestic appliances and light industrial machines.

Single phase, Split phase or Capacitor start, and Three phase at 2,850, 1,420 or 940 r.p.m.



Fully tested to B.S.S. 170—1939 Section 10. Approved by Canadian Standards Association.

BROOK MOTORS Ltd

HUDDERSFIELD • ENGLAND

1.LD.228

Printed in England for the Proprietors, THE ELECTRICAL TIMES, LTD., by SUN PRINTERS, LTD., London and Watford, Herts, and published at Sardinia House, Sardinia Street, London W.C.2. August 28, 1952

Aeroflex Ceram HOPES PATENTS

REWIREABLE CARTRIDGE FUSE LINKS *in* RADOK CONTACTS

FIRM FINGER PRESSURE ONLY

GIVES:—

- **Perfect Electrical Continuity Fractional Millivolt Drop**

The design of these Fuse Units enables a powerful leverage to be exerted against the fuse blades, merely by finger pressure.

1.25 FUSING FACTOR
25 M.V.A. BREAKING CAPACITY

Aeroflex Radok Fuse Units are fully shrouded and thus meet the requirements of the Factory Acts. They incorporate the compact and economical Aeroflex Ceram Fuse Links which embody the essential Aeroflex features of rewireability and low fusing factor in sizes up to 1,000 amps.

200 • 400 • 600 • 1000 AMPS, 440 V

PARMITER HOPE & SUGDEN LIMITED
FLUVENT Electrical Works, Longsight, MANCHESTER 12
London : 34 Victoria Street, S.W.1 Glasgow : 162 Buchanan Street, C.1
Birmingham : 39/41 Carrs Lane, 4.

dm FH 43

" We had the same sort of trouble at the Magnificent until we installed Mazda lamps and lighting equipment "

* * *

Confusion reigns when lights are low
It pays to make your lighting stronger
The wisest kitchen planners know
That Mazda lamps stay brighter longer

Mazda

B T-H

THE BRITISH THOMSON-HOUSTON CO. LTD. (*Member of the A.E.I. Group of Companies*) 4410